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# THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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# EGYPTIAN

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# METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

VOL. 22 NEW YORK, APRIL, 1924 No. 4

# The Production of Antimony and Lead

## The Manufacture of Lead Products

### A Visit to the Well Known Works of Cookson & Company, Newcastle-on-Tyne, England. Conclusion*

Before describing the manufacture of the oxides, notice should be made of the sheet lead and pipe departments. Slabs weighing 10 tons are cast for rolling, and any gauge from 9 to 10 ins. downwards can be supplied. In the pipe lead extruding works, two presses are almost continuously at work producing pipes up to 8 ins. internal diameter, and for this can develop 6,000-7,000 lbs. pressure.

WHITE LEAD.

This is made at the Hayhole Lead Works. Two processes are in operation, viz., the Stack and Chamber.

1. **The Stack Process.**—This is commonly known as the old Dutch process, though today it is slightly modified, in that, instead of dung, spent oak bark is used for generating heat and carbon dioxide. Old as it is, the firm claim to produce by it as fine an article as could be desired. There are certain drawbacks which is is impossible to overcome, and for these reasons much of the supply is replaced by the more modern Chamber process.

In the Stack method, the floor is strewn with spent bark, and on this the pots containing dilute acetic acid are placed. Strips of lead, or "wickets" as they are termed in this process, are carefully laid over the pots. Another floor of boards is then made, and a further layer of bark, pots and lead, and so on until the stack is made up.

Fermentation of the bark begins and the heat generated raises the temperature of pots and lead to 40-35 degrees C. A further result of the fermentation is the evolution of carbon dioxide, and this gas, in conjunction with the acetic acid vapor, attacks the lead, forming first what is called a basic acetate of lead, which in turn is changed by the carbon dioxide to a basic carbonate of lead. In the presence of the water vapor we obtain the product sought after—white lead—its chemical name being a hydrated basic carbonate of lead.

2. **The Chamber Process.**—Upwards of 25 years ago Cooksons adopted a new process of corroding the lead, a method called the Chamber Process. No other works in this country is using it today. In fact it may be said that outside of Germany no other firm than Cooksons have made use of it.

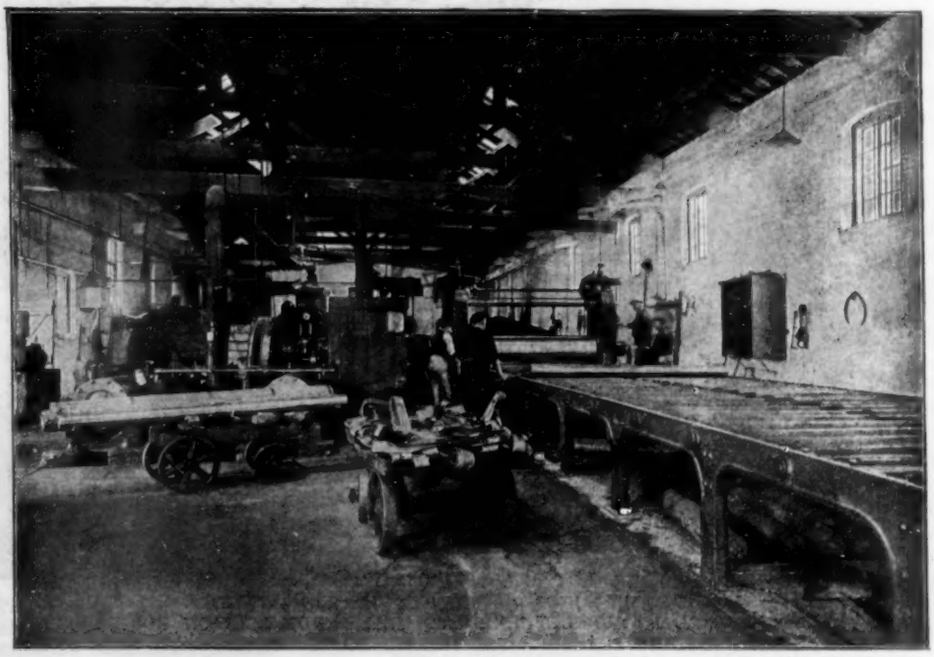


FIG. 6.—THE PURE REFINED PIG LEAD IS MELTED DOWN, RUN INTO A CASTING BED TO SET IN A SLAB. THIS SLAB IS LIFTED ON TO THE ROLLERS, WHERE IT IS ROLLED TO UNIFORM THICKNESS.

*Part 1 on Antimony Production was published in our issue for October, 1923.

The chambers at the Hayhole works are 26 feet square by 24.5 feet high, thus giving a capacity of about 17,000 cubic feet. It is arched throughout by means of 16 columns so placed as to give in all 300 arches. Across these, sticks are sprung upon which the straps of lead are laid. These are 4 inches wide and 4 to 5 feet long, and weigh about 3 pounds each. In charging the chamber, 40,000 of these straps are suspended.

In principle the method of attacking or corroding the lead is the same as in the old Stack process, with one notable difference. The carbon dioxide, water vapor, and acetic acid are, in the newer method, under perfect control. The diagrammatic view of a chamber (Fig. 7) will illustrate this. Everything needed for the corrosion is under separate controls. The small coke stove for the making of carbon dioxide can be adjusted to give either much or little of this gas; a water bath is kept heated so that water vapor may be supplied as needed; an acetic acid is allowed to drip into an earthenware pipe at the discretion of the operator. Small doors are provided so that at any moment an inspection can be made of the operation.

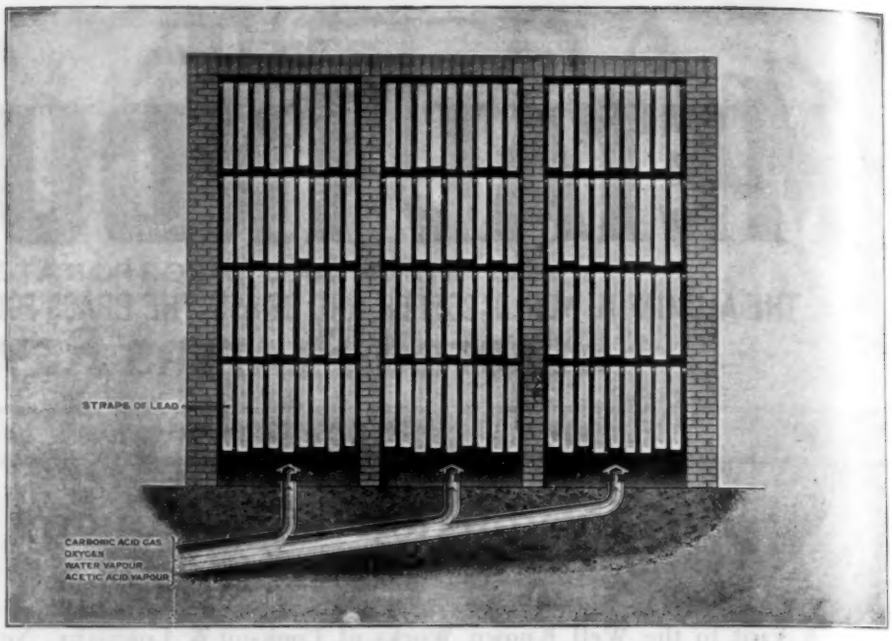



FIG. 7.—DIAGRAM SHOWING DETAILS OF THE CHAMBER PROCESS.

Despite this, the Stack process is not obsolete. When the corrision proceeds normally (depending on the quality of the spent oak bark and the progress of fermentation) the white lead produced is of extremely fine quality, and closely resembles best china when fractured. The physical condition of the product obtained is evidently preferred by many paint experts, for frequently a combined white lead is specified, i. e., a mixed white lead made up of material from each process, though, taking it all in all, preference must lie with the Chamber process, because of its reliability, faster working, and complete control of corroding gases and temperature.

The remaining parts of the operations are identical with both processes. The white lead is ground and cleaned. It is then sent to one of the press houses, where it is forced into a filter press and as much water as possible pressed out of it. Being still in a wet condition, it is taken to the driers, and in a few days is then ready for casking as genuine dry white lead. When ground with refined linseed oil it is called genuine ground English white lead. Owing to the strong affinity for oil, the grinding is accomplished with moist white lead. Water is expelled as the oil combines with the pigment.

8.—IN THE MANUFACTURE OF PIPES, THE NEW SOFT LEAD IS MELTED, RUN INTO CONTAINERS, AND ALLOWED TO COOL. IN THE CENTRE OF THE CONTAINER HAS BEEN PLACED A STEEL MANDREL TURNED TO THE INSIDE SIZE ON BORE OF PIPE REQUIRED. BY HYDRAULIC PRESSURE THE CONTAINER IS FORCED AGAINST A FIXED WROUGHT-IRON RAM, IN THE BOTTOM OF WHICH IS PLACED A METAL DIE TO THE THICKNESS OF PIPE REQUIRED, AND WHEN THE LEAD IS PRESSED THROUGH THIS DIE THE WALLS OF THE PIPE ARE FORMED.

### LITHARGE

For the operation of litharge the lead is oxidized in a reverberatory furnace or in crucibles, and to hasten the operation the metal is agitated, so that as much as possible may be exposed to the air. This is removed as formed and well ground under water. A finely-powdered litharge is obtained, though it usually contains 2 to 3 per cent of metallic lead, and has a greenish-yellow tinge. It is sometimes sold as a cheap variety of litharge, but the vast

bulk of their manufacture is subjected to a further treatment for the removal of the free lead. When this is completed the litharge is of a bright canary color, extremely free from grit and soft in texture.

During the war large quantities of litharge were supplied to the Royal Naval Air Service for proofing airship fabric. The specification was an extremely rigid one. Not more than 0.02 per cent had to be insoluble in nitric acid, and not more than 0.1 per cent in acetic acid. Cookson & Co. consistently passed these tests in all consignments sent in.

Assay litharge is also regularly supplied for use on the gold mines; for this purpose it must be guaranteed to contain not more than eight grains of silver per ton.

In all the possible applications of litharge the firm is certainly alive to the requirements of each. For the rubber manufacturers the litharge must be in a fine state of division and free from peroxide of lead; for the color manufacturer it must dissolve quickly, giving a clear, cloudless solution from which no troublesome sludge will settle; for the accumulator manufacturer chemical purity is generally the first consideration, and for most purposes fineness is essential. Such care in seeking to fulfil the conditions laid down in the varied applications of their product is in harmony with their policy throughout the works.

### ORANGE LEAD

A few years before the war the supply of this material was almost entirely in the hands of the Germans. It was

FIG. 9.—IN THE STACK PROCESS THE ENCLOSED CHAMBERS ARE FILLED FROM BOTTOM UPWARDS. FIRST A LAYER OF SPENT OAK BARK, THEN A QUANTITY OF SMALL POTS CONTAINING ACETIC ACID, AND FINALLY A QUANTITY OF LEAD STRIPS, WHICH ARE PLACED ON THE POTS. THE WHOLE IS COVERED BY FLOOR-BOARDS AND THE PROCESS REPEATED UNTIL THE STACK IS COMPLETED. THIS PROCESS OF CORROSION USUALLY TAKES ABOUT THREE TO FOUR MONTHS.

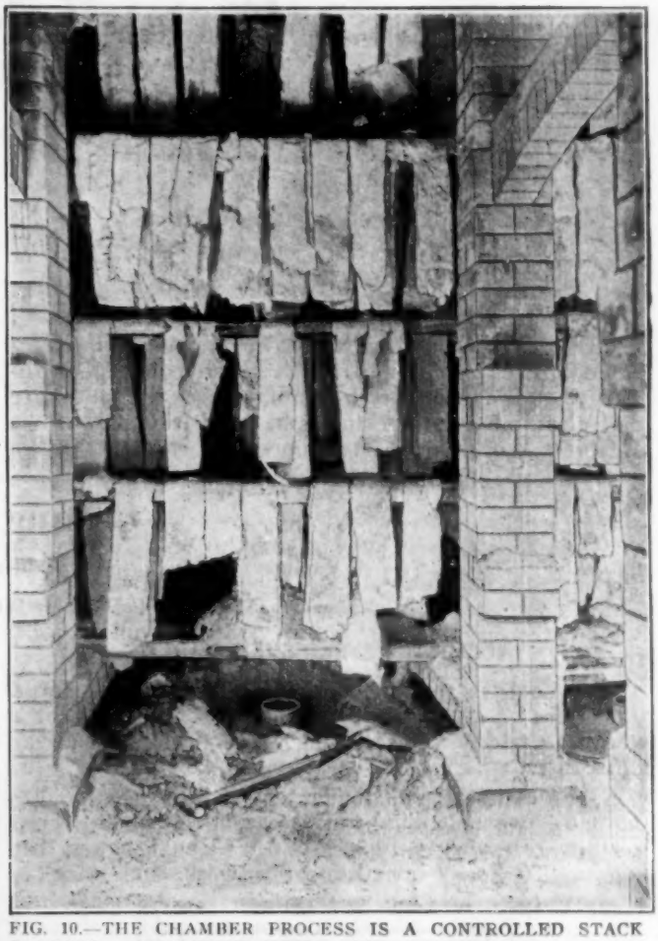


FIG. 10.—THE CHAMBER PROCESS IS A CONTROLLED STACK PROCESS. STRIPS OF LEAD ARE SUSPENDED IN LOFTY CHAMBERS AND CORRODED BY THE ACTION OF STEAM, CARBONIC ACID, AND ACETIC ACID.

manufactured by a patent mechanical process which originated in England, and Cooksons set themselves to capture this after they had become interested in the British patent rights of the process. They were successful, and they gradually took an increasing share in the sales in this country, until in 1914 they had, by means of an even better orange lead, taken over a preponderant share of the British trade.

### RED LEAD

When the litharge, i. e., the monoxide, is heated to 450-470 degrees C. it is converted into the ordinary red lead of commerce. At the works this operation is carried out in a large reverberatory furnace, and so carefully is this under control that the purity and percentage peroxide of lead can be guaranteed.

As in the case of litharge, the applications are varied, and many narrow limits are stated in different specifications.

One particular instance will illustrate this—the stringent demands of the manufacturers of high-grade glass. To satisfy these clients the firm knew they must meet and fulfil the following three conditions:

(1) A very high purity, with uniform color and texture.
(2) A consistent composition.
(3) Freedom from injurious impurities, such as iron, antimony, and bismuth.

They can now give a guarantee that these are fulfilled, and to indicate the average analysis of the ma-

terial they have supplied, the following results are an average of samples taken from day to day over a period of weeks, viz.:

| | Per cent. |
|---|---|
| Copper | .0002 |
| Silver | .0005 |
| Bismuth | .002-.005 |
| Arsenic | nil. |
| Antimony | .0004 |
| Tin | nil. |
| Iron | .003 |
| Zinc | .0004 |
| Silica | .006 |
| Lead peroxide | 19-25 (average 23) |

One aspect of the matter, however, should be mentioned. No products such as these could be ordinarily and consistently manufactured without care and cleanliness in working, and in visiting Cookson's Hayhole Works one was impressed with the orderliness and cleanliness of all the departments. The writer remarked upon this to the works manager. His reply was that they realize the need of it for their employees as well as for the products. Although their output in white lead and oxides represents many thousands of tons annually, they have had no cases of lead poisoning in the red lead or litharge departments during the past twelve years, and in the white lead department there have been only five mild cases in the same period. Furthermore, it was stated that many of the Home Office regulations at present in force for such works had been already adopted before such regulations were published.

The Hayhole Works may not be metallurgical works as we usually understand the term; it is, nevertheless, of remarkable interest for the manner in which the whole establishment has been designed to carry through quickly and efficiently the demands for oxides of lead.

# Casting Metals

## A Variety of Melting and Molding Troubles and Their Solutions*

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

### ALUMINUM STERILIZING TABLE

Q.—We have trouble in casting aluminum leg for a stand, also on an aluminum lid that fits on the legs for a sterilizing table. We are using aluminum scrap such as crank cases.

A.—In casting the aluminum legs and lid for a sterilizing table, we note that you are using aluminum scrap for this work, such as crank cases. We would suggest that you use 50% new metal for this work, and make as

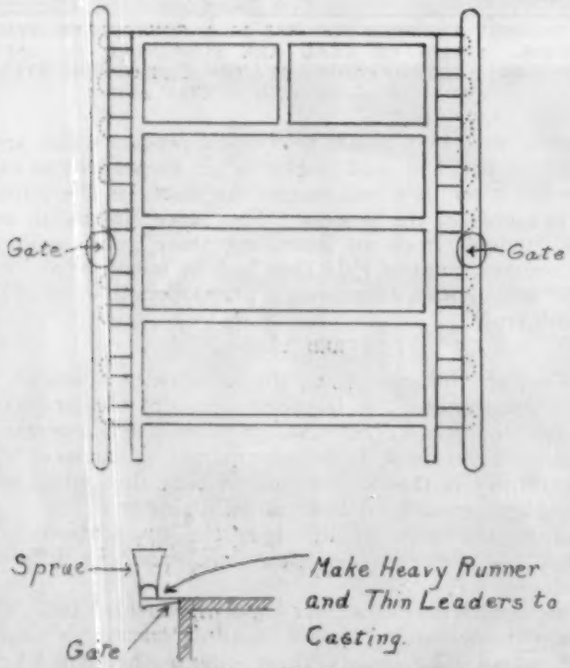



FIG. 12. GATING ALUMINUM TABLE LEGS

follows: Melt first 50 pounds of pure aluminum, a little at a time, and stir well and pour into ingots. If you cannot secure light copper, melt the copper in a crucible and pour into the aluminum and stir, and pour into ingots, and use as a hardener by melting 42 pounds aluminum and adding 8 pounds hardener, and then adding 50 pounds of your scrap metal. You make the amount of metal to suit your requirements. Just before pouring add a spoonful of chloride of zinc to clean the metal. Do not pour the metal at more than 1,400° F.; 1,250° F. is better if it will run. We suggest that you gate the leg pattern as per Fig. 12,

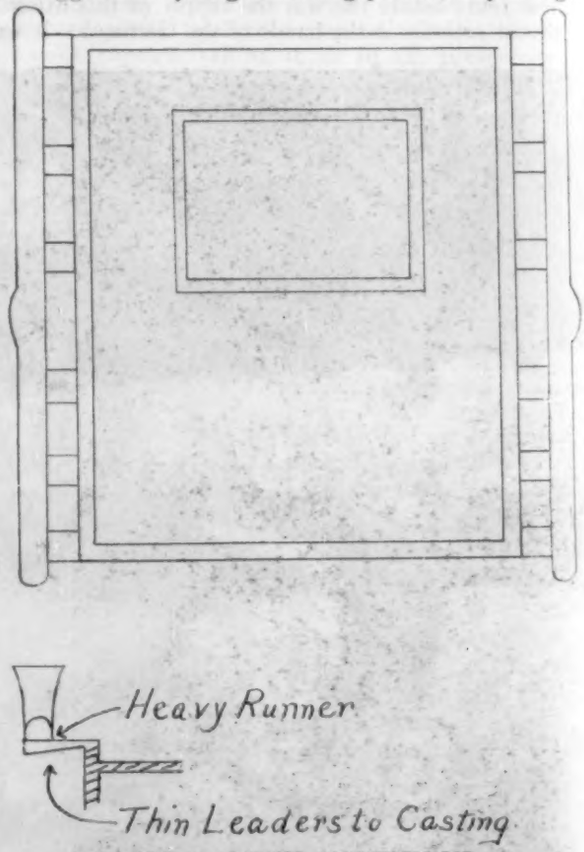



FIG. 13. GATING ALUMINUM LID

make the runner good and heavy with a thin wide leader to casting and place a nail made of aluminum in the section that gives trouble. We would also suggest that you gate the lid like Fig. 13, and remove the casting from the mold as soon as possible, break off the gates and place the lid casting in a straight surface and weight down for a few hours or over night, which would be better. This will remedy the trouble that you may have with warping.

# British Institute of Metals Meeting

## Abstracts of Papers Read at the Annual General Meeting in London, March 12-13, 1924

### THE RELATION BETWEEN THE TENSILE STRENGTH AND THE ELECTRICAL RESISTIVITY OF COMMERCIALLY PURE COPPER

By W. E. Alkins

In this note an account is given of two short series of experiments carried out with the object of investigating the relationship which exists between the tensile strength of commercially pure copper as it is hardened by wire-drawing and the accompanying increase in its resistivity.

The results show that the relation between the tensile strength and the percentage increase of the resistivity as compared with the annealed wire is reasonably rectilinear when the tensile strength exceeds 20 tons per square inch, and it is suggested that the resistance (RT) of any given wire of tensile strength T tons per square inch should be taken as:

$$RT = Ra\left(\frac{100 + \frac{T}{10}}{100}\right)$$

where Ra = the resistance of a similar annealed wire corresponding to the international standard.

### THE BRITTLE RANGES IN BRASS AS SHOWN BY THE IZOD IMPACT TEST

By D. Bunting

It has long been known that certain brass alloys are brittle at high temperatures. As these alloys are worked and sometimes put in use at temperatures in the neighborhood of that at which brittleness occurs, it is of importance that this fact should be investigated.

Brittleness occurs in all brasses containing less than 90 per cent of copper, being first encountered in 90:10 brass, in which the brittle range exists from 470° C. to 540° C. With increase of zinc the range expands, and in the case of a 70:30 brass occurs between 325° C. and 800° C. At a composition of 65 per cent copper the range extends from 325° C. until the solidus is entered. The $\alpha + \beta$ alloys are found to possess a recovery of toughness at high temperatures. The brittle range of the 58:42 alloy extends from 325° C. to 450° C., above which temperature the recovery of toughness occurs; any further increase of temperature causes the plasticity of the metal to become more pronounced. These alloys comprise those employed for hot-stamping, hot-rolling and similar work.

The alloys were examined in two conditions, chill cast and annealed, and it was found that with the rapidly cooled alloys there was a general increase in the brittle ranges, due in the case of $\alpha$ alloys to coring, and in the case of $\alpha + \beta$ alloys to the production of increased quantities of $\beta$.

### THE CADMIUM-LEAD-ZINC SYSTEM

By Maurice Cook

Data concerning the three binary systems involved in the investigation have been collected and diagrams based on these data are given. The ternary system has been investigated thermally and microscopically. The freezing points and other thermal arrests for ninety-six different alloys are given. Near to the cadmium-lead binary eutectic is a ternary eutectic containing 81.7 per cent lead, 17.3 per cent cadmium and 1 per cent zinc which freezes at 245° C. There is a large zone in which the metals are not completely miscible in the liquid state. This occupies most of the area between the zinc corner and the lines joining the ternary eutectic to the lead-zinc and cadmium-zinc eutectics.

### THE RELATIVE CORROSION OF ZINC AND LEAD IN SOLUTIONS OF INORGANIC SALTS

By J. Newton and J. S. Tidmus

The authors have studied the rates of corrosion of zinc and lead when immersed in varying concentration of different inorganic salt solutions. The results are found closely to resemble those obtained with iron under similar conditions, and the explanation appears to be substantially the same.

### DETERMINATION OF THE THERMAL COEFFICIENTS OF EXPANSION OF SOME COMMERCIAL METALS AND ALLOYS

By J. Newton Friend and R. H. Vallance

A simple form of apparatus is described whereby the coefficient of expansion of a metal bar with rise of temperature can be rapidly determined with an accuracy of about 1 per cent.

### COPPER-ZINC ALLOYS WHICH EXPAND ON SOLIDIFICATION

By K. Iokibe

The remarkable expansion which takes place when certain copper-zinc alloys are slowly cooled, first observed by Turner and Murray, has been re-examined. Extensometer tests show that the expansion is observed only with alloys containing from 5 per cent to 30 per cent of copper. There is a sharp maximum peak with 15 per cent of copper. The alloys, if very quickly cooled from the molton state, have a density which is slightly higher than that calculated on the assumption of no volume change: in other words there is a contraction on alloying. The amount of expansion varies with the rate of cooling; with very slow cooling the density may fall from 7.3 to 6.2, corresponding with an expansion of about 18 per cent. The force of the expansion is sufficient to break the crucibles in which the alloys are allowed to solidify. The increase of bulk is due to the formation of minute voids, which are not gas holes. When compressed the alloys increase in density: drillings or turnings give values practically identical with those obtained by very rapid cooling. Slowly cooled alloys are of uniform composition throughout: but chill cast bars though of uniform average composition when examined in horizontal sections, are inversely segregated vertically. Rapid cooling leads to a concentration of copper, the less fusible metals toward the centre of the bar. The more rapid the cooling, the greater is the difference in copper content between successive vertical layers on proceeding from the outside to the inside of the bar. The difference may amount to as much as 25 per cent of the total copper content. The maximum inverse segregation in rapidly cooled alloys coincides with the maximum expansion of slowly cooled alloys. Chill cast alloys on annealing expand, while the copper content tends to become uniform throughout. In the range of considerable expansion and of inverse segregation, there is no definite microstructure: separate constituents are no longer clearly recognizable, but all is blurred and confused. The expansion appears to be connected with the change, on slow cooling or annealing, from the unstable state of inverse segregation to the stable state of uniform composition.

### THE EQUILIBRIUM DIAGRAM OF THE COPPER-TIN SYSTEM

By M. Isihara

The method adopted in the present investigation consists of measuring the electric resistance of the alloys at different temperatures, the rate of heating and cooling being slow enough to enable the equilibrium state to be obtained. By means of the breaks in the resistance-temperature curves, the liquidus, solidus, and other transformations are determined. From the results of the experiments conclusions are drawn and an equilibrium diagram plotted.

### THE CONSTITUTION OF THE ALLOYS OF COPPER AND CADMIUM

By C. H. M. Jenkins and D. Hanson

The constitution of the alloys in the solid state has been determined to 300° C. for the copper-rich alloys, and to 200° C. for Cadmium-rich alloys.

The solid solubility of cadmium in copper (α) has been found to be approximately 2.7 per cent, while the solubility of copper in cadmium is approximately 0.07 per cent.

The concentrations representing the homogeneous phase fields are suggested to correspond closely to those of the compounds $Cu_2Cd$, $Cu_4Cd_3$, $Cu_2Cd_3$ and $CuCd_3$. At temperatures below that of their formation $Cu_4Cd_3$, $Cu_2Cd_3$ and possibly $CuCd_3$ possess a solubility in the solid state for either copper or cadmium.

### X-RAY STUDIES ON THE COPPER-ALUMINIUM ALLOYS

By E. R. Jette, G. Phragmen, and A. F. Westgren

The alloys used for the investigation were made by melting together copper and aluminium of the usual electrolytic quality. Sand crucibles and a carbon resistance furnace were used for this purpose. To lower the oxidation, the meltings were in some cases protected by a layer of soda-glass slag. All the alloys were examined microscopically, to be certain that they were practically homogeneous and free from inclusions. The copper content was determined in all the alloys, and, whenever especially important, the aluminium content was also established.

A series of these alloys, slowly cooled from the liquid state, was investigated by the powder method. The X-ray apparatus (iron anticathode) and the cameras used for taking the powder photograms were described at a recent meeting of the Iron and Steel Institute. Photograms are reproduced in the present paper, from which it can be seen at once that four different phases appear in these alloys.

The $CuAl_2$ phase has tetragonal structure, with an axial ratio of 0.805. The elementary prism is body-centered, and contains four molecules of $CuAl_2$. The phase present in the range 16 to 25 per cent aluminium has a cubic lattice. In the 16 per cent alloy the elementary cube contains about 52 atoms, and in the 25 per cent alloy the corresponding number is only 49. The solutions within the range are thus formed by a **complex substitution.** The curve of the change of density is in closest agreement with that obtained by supposing that three copper atoms in the lattice are replaced by two aluminium atoms. A photogram of a quenched specimen containing 12.5 per cent aluminium shows lines corresponding to a phase stable only at higher temperatures.

### THE TENSILE PROPERTIES OF ALUMINIUM AT HIGH TEMPERATURES

By T. Martin

Tensile tests on two qualities of aluminium at temperatures up to the neighborhood of the melting pot, show a continuous diminution in the strength of the metal, with corresponding increase of ductility, up to about 325° C. At this temperature a marked change in the mechanical properties, shown by discontinuities in the maximum stress and other curves, takes place, which is attributed to a sudden increase in the rate of recrystallization.

Tests on cold-worked material indicate that up to 200° C. the added strength conferred by cold work is well maintained. Above this temperature the rate of softening is such that tests must be made on metal previously fully annealed to have any practical value. The results bring out the importance of **quantitative** observations of the time and temperature conditions of annealing as a preliminary to tensile testing at high temperatures.

The tests on the less pure metal show that the effect of the impurities present is to make the metal **stronger but less ductile** at all temperatures, while the marked increase in ductility **occurs at a temperature** fully **75°C. higher.**

Tests at two different rates of extension show that, **at all temperatures above the atmospheric,** the maximum stresses observed for the faster rate are greater than those for the slower rate, the effect increasing with the temperature. Separate and distinct curves are obtained for the two rate. At 300° C. a temperature at which aluminium vessels are frequently used in practice, the maximum stress observed may be increased by more than 10 per cent by trebling the rate of extension. The results indicate that the time factor in high temperature testing is of greater importance than has hitherto been suspected. They raise doubts as to the value of hot tensile tests on metals as ordinarily carried out, and show that special methods of testing must be used for aluminum above the atmospheric temperature.

### THE INVESTIGATION OF A FATIGUE FAILURE OF BRASS TUBES IN A FEED WATER HEATER—WITH A CONSIDERATION OF THE NATURE OF FATIGUE

By W. E. W. Millington

This paper describes a curious failure of brass tubes in an actual case of engineering importance. By a process of elinination the cause of failure was diagnosed as "fatigue," due to vibration of the tubes. New tubes, suitably stayed, were fitted and the trouble ceased, but it still remained to consider the exact nature of the process by which the failure occurred.

In the course of the account of this investigation, involving a study of the close-packed cubic material, the authors show a movement on octahedral planes, which they term "easy glide" in distinction to "slip" causes:

1. Plastic deformation in hot and cold working.
2. Changes of packing from cubic to hexagonal.
3. Mechanical twinning.
4. Fatigue.

Stress-strain diagrams are discussed taking the "easy glide" into account. This is developed to show the movement which will take place in an aggregate of crystals under cycles of stress and that, in certain circumstances, twin bars (Nelmann lamellæ) are cumulatively formed in the material which not only stiffen the crystals but also cause them to become internally stressed, until eventually failure results.

This new "fatigue" theory of the authors is compared with the observed facts of the actual failure.

### THE EFFECT OF CASTING TEMPERATURE ON THE PHYSICAL PROPERTIES OF A SAND-CAST ZINC-BRONZE

By Francis W. Rowe

The author has investigated the influence of casting temperature on the physical properties of a bronze of the following composition:

| | Per Cent |
|---|---|
| Copper | 87.96 |
| Tin | 6.08 |
| Lead | 0.52 |
| Zinc | 5.31 |
| Phosphorous | 0.021 |
| Iron | 0.02 |

6 boxes of test bars were molded in green sand. Each box contained two 14" x ⅞" diameter bars. These were run with an 1¼" diameter down runner terminating in a splay to both bars. The riser was exactly similar to the runner. The boxes were cast from the same pot of metal at different temperatures. The temperature was taken immediately prior to pouring with a Foster base-metal thermo-couple. The results of the tests on these bars are tabulated below:

| No. | Casting Temp. °C. | Yield Point Tons Per Sq. In. | Max. Load Tons Sq. In. | Elong. on 2 Ins. | Izod Impact Aver. | Brinell Hardness |
|---|---|---|---|---|---|---|
| 1 | 1210 | 7.9 | 17.3 | 37 | 13.8 | 51.8 |
| 1A | 1210 | 7.8 | 16.9 | 35 | 13.6 | 50.3 |
| 2 | 1170 | 8.0 | 17.4 | 39 | 21.8 | 54.3 |
| 2A | 1170 | 8.1 | 17.3 | 38 | 20.7 | 56.0 |
| 3 | 1130 | 8.2 | 18.4 | 50 | 23.3 | 57.7 |
| 3A | 1130 | 8.2 | 18.7 | 51 | 28.0 | 58.6 |
| 4 | 1090 | 8.1 | 14.5 | 18 | 18.0 | 60.5 |
| 4A | 1090 | 8.2 | 15.6 | 23 | 18.0 | 59.6 |
| 5 | 1050 | 8.0 | 11.0 | 6 | 16.2 | 61.5 |
| 5A | 1050 | 8.1 | 13.4 | 10 | 15.8 | 60.5 |
| 6 | 1020 | 8.2 | 10.2 | 4 | 17.0 | 62.5 |
| 6A | 1020 | .. | Badly Blown | .. | 16.0 | 63.6 |

The tensile strength, the elongation and impact figures showed a marked optimum with a casting temperature of 1130° C. The Brinell hardness figure rose steadily as the casting temperature fell, which feature is common to all gun-metals and bronzes.

### THE ALUMINIUM-COPPER ALLOYS—ALLOYS OF INTERMEDIATE COMPOSITION

By David Stockdale

In a former paper the author described the copper-rich aluminium-copper alloys. Now a diagram is put forward which embodies work done on alloys containing between 16 per cent and 76 per cent of aluminium. The methods used have been thermal and microscopic and the results show that the alloys form a very complicated series of solid solutions. The compound, $Cu_2Al$, has been shown to exist in two polymorphic modifications. A second series of solid resolutions, which is stable at high temperatures, is remarkable in that the structure cannot be maintained even by the most sudden quenching. This series, too, may exhibit polymorphism. The compound $CuAl_2$, once formed, is extremely stable, and neither copper nor aluminium can dissolve in it.

It is also shown that silicon, even in small quantities, exerts a very disturbing influence on the diagram, probably through the formation of the compound $Cu_3Si$.

The intermediate alloys are all white, and exceedingly brittle. Saturated solutions show strange twinning effects and are very difficult to polish. It is unlikely that these alloys can be put to any common industrial use even though they are extremely resistant to the corrosive action of acids.

### THE EFFECT OF GOLD-DRAWING AND ANNEALING ON SOME ELECTRO-CHEMICAL PROPERTIES OF A LOW-TIN BRONZE

By Stuart H. J. Wilson

The thermo-electric power of a series of cold drawn bronze wires has been determined. This at first rises and then ceases to do so as the amount of cold work is increased. With still more work the power again increases. The curves showing the relationship of the thermo-electric power to the amount of reduction in drawing are analogous to those obtained for other physical and mechanical properties. The effect of the drawing operation at different depths in the wire is also investigated and it is shown that the wire is very far from homogeneous. On annealing a cold drawn wire the thermo-electric at first undergoes little alteration, but at a temperature of 400-500° C. shows a rapid and important increase, thereafter falling to a value lower than that in the cold drawn condition. Measurements of the electro-chemical potential show at first a marked rise to a maximum as the wire becomes more and more worked. They then fall to a minimum and finally again rise.

### RELATION OF HEAT TREATMENT, MECHANICAL PROPERTIES, AND MICROSTRUCTURE OF 60-40 BRASS*

By Robert S. Williams[7], Ph.D. and Victor O. Homerberg[8], Ph.D., Cambridge, Mass.

A description is given of a double heat treatment of 60-40 brass. Photomicrographs are included to show the changes that take place in the microstructure on reheating the water-quenched specimens. A wide variation in the mechanical properties may be obtained by the described heat-treatment method.

### RELATION OF HEAT TREATMENT, MECHANICAL PROPERTIES, AND MICROSTRUCTURE OF 60-40 BRASS*

By Victor O. Homerberg, Ph.D., Cambridge, Mass., and Dexter N. Shaw[9], M.Sc., Akron, Ohio

#### SUMMARY

If brass in the beta condition is used, a gradual increase in hardness and in tensile strength and a gradual decrease in ductility are obtained on reheating the quenched material to 250° C. Between this temperature and 450° C., the reverse is true. From 450° to 750° C., there is a slight increase in hardness and in tensile strength and a decrease in ductility. The maximum tensile strength of 82,750 lb. per sq.in. and the maximum hardness of 241 with no elongation were obtained at 250° C., the structure showed very fine alpha and the fracture was intercrystalline.

*Abstract of a paper read at the meeting of the Institute of Metal Division, in New York, February 18-20, 1924.

## Grinding Brass Faucets

Q.—What grades of abrasives are used in grinding and polishing brass faucets?

A.—The grade of abrasives used for polishing brass faucets varies with the shops in which it is used; the opinions of the man in charge usually determine the operations. The common practice is to use 80 grade Turkish Emery to cut down, and 120 grade to finish, then trust to the buffer to complete the job. This method is used on the cheaper grade of work. In the better grade, the cut down is usually made by an 80 grade wheel, the next cut with 140 grade, and the final with a 150 grade grease wheel, before turning over to the buffer. This procedure makes an excellent job (provided the metal is clean) and if properly handled costs but little more than the first method. In some factories the use of straps (with the same grades of emery) is preferred to that of wheels, the users claiming to get better and quicker results. Each method has strong advocates but the number favoring wheels far exceed those using straps.—W. F. Hirschmann.

# Why Molding Machines?

## An Answer to This Question. Also When and How to Use Molding Machines

Written for The Metal Industry by C. W. MILLER, Foundry Engineer

It would surprise you to know how many mighty good foundrymen have asked me that question in the last five years. The gratifying thing is, however, that a large percentage of these same men are now able to answer the question for themselves. These men, who are now making a success of machine molding, were wise enough to consult with those who could advise them, and then carefully selected machines suitable to their class of work. They then took the next step, which is of just as much importance as the machine itself. They provided proper flask and pattern equipment to work in conjunction with the machine.

### MOLDING MACHINES GONE WRONG

The next statement is going to touch some readers on a tender spot. It is a fact, nevertheless, that there are hundreds of molding machines in shops around this country, for which firms have paid out good money, and installed in their plants, which are now standing idle or are being used occasionally in a half-hearted manner. Very often the reason is that the machine is of the wrong type for the class of work to be done. Sometimes the machine is O. K. and the flask and pattern equipment are wrong. Then, again, we run across instances where everything is right, but the man in charge of the work has failed to get behind it and push it, as he must do to make any machine a success.

### ADVICE TO THE FOREMAN

Just a word to the foreman, at this stage. If your firm has put a molding machine into your foundry, and it is the proper type, they have done you a favor, and it is a sure sign you are working for a progressive concern. Now, then, let's suppose that the "Missus" has been doing the family washing in the old-fashioned way for years, and you are suddenly hit with an acute attack of "heart expansion." You step to the front and buy her an up-to-date washing machine, which will enable her to sew, cook, play the victrola and do the washing all at the same time; **and she does not use it.** How would you feel? Well, how about the boss, after he has bought a molding machine, and you immediately start to use it for a hat rack on which to hang old flasks and junk of all descriptions? He will feel good about it—I guess not! Just see that he gets you good patterns and flasks, use the "stuff" you carry around under your hat, pick good steady men for operators, and go to it. An operator does not have to be an exceptional man. If he is steady and willing and shows inclination to learn, that is all that is required.

Study the operation of the machine carefully and the job you put on it. Then stick with your operator and teach him, patiently, just how to go about the work to make the mold with the least possible number of moves and expenditure of energy. I don't mean to **tell** him to do it, but to **show** him, stay right with him until he gets it, and it will surprise you how quickly he will develop into a first class operator. If you select the wrong man the first time, try another. You can always find one who will fit.

### ADVICE TO THE MANAGER

The word to the manager is, be sure you are getting the right machine for your foreman, then equip it properly and insist that he gets the best out of it. Work together on the deal and your machine will prove a blessing instead of a headache. This applies to all foundries right down the line, brass, aluminum, iron and steel.

### WHEN TO USE MOLDING MACHINES

There are six important points to cover in connection with molding machines in the brass foundry.

**First. Under what conditions is it advisable to use machines in the brass foundry, and when is it poor policy to use them?** It is advisable and necessary to use machines of the proper type in any brass foundry which has floor space enough in which to place the molds so that production will not be held up while waiting for the metal, and in which the orders on the work are large enough to warrant construction of the proper patterns, which will work to the best advantage on the machines. I do not mean by this that the orders need run up into the thousands to warrant a good pattern. If the order is for only one hundred or even less, and there are to be repeat orders, the chances are that you will pay for the pattern on the first order, and make a profit besides. Rig your patterns up right and you will find that it costs very little more, if any, to make them for a machine, than to make them for the old way. Of course if your work consists of a lot of odds and ends, with small orders of one and two castings, on what is termed "loose work," and no chance of the pattern ever going into the sand again, it would be poor policy to build anything but the cheapest sort of pattern to get the castings made and off your hands. Even on his "loose work," however, it is often an advantage to put several patterns of different kinds on a follow-board, loose, and use the machine to jar up the drag and then ram the cope by hand. However, as a general rule brass castings are made in quantities sufficient to warrant making up a machine pattern, and one small hand bench or floor will generally take care of the odd jobs to be made by hand.

### BEST TYPE OF MACHINE

**Second. What types of machines are best suited to different classes of work?**

For the very small pieces, the depth of which is not much over an inch, and the shape of which is such that the sand may be "squeezed" evenly over and around the pattern, a small power squeezer machine is most generally used. The work, of course, should be molded in a snap flask, with duplicate patterns of sufficient number to fill up the flask, either mounted on steel pattern plates, and gated up, or better still, cast the patterns on aluminum plate, cope part on one side and drag part on the other. In making the mold the plate is assembled with snap flask and set on the machine, drag side up. Then drag is filled and the bottom board put in place; the flask turned over and the cope part filled. Then pull the squeezer head over, and one squeeze takes care of both cope and drag. The pattern plate is fitted with a small vibrator, hose and knee valve. The operator starts the vibrator and lifts the cope off, vibrates again and draws the pattern, closes the mold and places it on the floor, then starts another mold. For medium size work, from two to three inches deep, sides of which are straight or nearly so, it is impossible to squeeze the mold properly.

If only the squeezing operation is used the mold is sure to be hard over the top of the pattern, and soft around the sides, and a very unsatisfactory casting will be produced. For this class of work, a machine should be used that will first jar the sand closely around the patterns, and then finish the job by squeezing the bottom or top as may be the case, thus giving a perfectly uniform mold and a

casting true to pattern. The method of molding on this type of machine is to mount the pattern or patterns, cope part on one board or plate and drag part on another, of course gated up. Use light, pressed steel, tight flasks. Place pattern on machine table, set on drag, fill and jar up, then squeeze, and place on bottom board, turn over and vibrate and draw pattern. Set drag on floor. Then, use cope pattern and make cope the same way. All drags can be set out on the floor first, or the operator can alternate with the patterns and close up complete molds, as he goes along. A snap flask is a good thing but don't try to go too far with it.

Last. We have the medium heavy and heavier grades of brass castings. For this class the best machine is the jar-ram-rollover and pattern draw machine. Use pressed steel flasks, and mount cope and drag patterns on separate boards. If the job is large enough to take up all space on the roll-over plate of your machine, attach your drag pattern and make the drags first, and then the copes. But, if the job is of such size that there is room on the roll-over plate for both cope and drag boards, then attach both, side by side, and ram up, turnover and draw both cope and drag at the same time, making a complete mold with each operation of the machine.

A machine of this type can now be procured which has a double equalizer device on the drawing mechanism, so that two molds (that is the cope and drag, or two copes or two drags) may be drawn perfectly at the same time, even though the two flasks are not exactly the same height or parallel with each other.

METHODS OF HANDLING MACHINES

**Third. Methods of handling and operating machines to get the best results.**

First, locate your machine or machines properly in your foundry. Take into consideration, light, getting metal from the furnace into the molds, handling sand, and getting the castings from the molding floor to the cleaning room. Try to start at one end and keep everything moving towards the shipping point. Have proper flask and patterns, good sand, good, steady operators, who must be given a just remuneration for their work, and taught that they must get the maximum production from the machine. Remember, also that the time consumed in getting the empty flask onto the machine, filling it with sand, and getting it ready, and to the point where the machine can do its part of the work is the largest item you have to consider. The actual operation of the machine, really consumes the smallest part of the time required to make the mold. Another time saving scheme, when using the jar-roll-over-draw type of machine, is to find a quick, safe method of clamping pattern boards to the roll-over plate and for clamping flasks to the plate while rolling over. Certain machine concerns help their customers along this line as well as others, through their service departments. The range of work is so great that no one method of clamping can be put to general use, and it is nearly always necessary to construct clamping devices suitable to the work at hand. **Above all things work with the machine.**

DIFFICULTIES AND REMEDIES

**Fourth. Difficulties which may be encountered and how to overcome them.**

A thousand and one things may bob up to harass and bother you when starting in the molding machine game, but they can all be overcome by persistent effort and the use of that very valuable accessory of the human anatomy commonly called the "noodle." The patterns may be wrong; correct them. The sand may be off; fix it. The operator may have some private ideas of his own, which he puts into action while you are not around, and then emphatically declares he "never done it," when you question him; get after him, and either by kindness or brute force separate the "ideas" from him, and have him do the work as you want it done. The sand may be too wet or too dry; use the "old bean" and get it going right. and a standard will soon be established which will bring the best results. Go easy at the start until you get the quality, then "step on it" for production. In other words supply for the machine, the brains, which it does not have. Go right to the bottom of any faults which may turn up in the castings, the production, the rigging, or anything else in connection with the outfit. Where there is a fault, there is a reason for it; find the reason and give it the air. First, buy the machine and then make it give what you expect of it. It will do this, if you kick it hard enough, but you have to kick it.

OUTPUT OF MOLDING MACHINES

**Fifth. The production gained by molding machine over hand methods.**

The general average on all classes of work is three to one over hand molding. In brass foundries, however, this ratio is considerably higher, and I know a great many places where it is running as high as six to one. A lot depends on the class of work, but you can always figure safely on three to one. In this, again, the points mentioned previously apply. If every part of the outfit is right, production naturally follows. It has to; if not, "Why Molding Machines?"

QUALITY OF MACHINE OUTPUT

**Sixth. Quality of machine made castings.**

The castings are always uniform in size, shape and weight. They come out of the sand true to pattern. For this reason brass castings made on a machine can have the minimum amount of finish allowed on the patterns, and will clean up in the machine shop. To illustrate, just a few days ago I saw brass bushings being made on a jar-roll-over machine. They were 2½" in diameter by 4" long. The pattern outfit consisted of two boards, cope and drag, with twelve half-patterns mounted on each board, gated up and matched, molded on the side. Both cope and drag boards were mounted on a 26" x 36" jar-roll-over-draw production machine, side by side. A 14" x 20" pressed steel flask was used, and cope and drag made at the same time. The finish allowed on these bushings was so little, that the machining operation was done by pressing the castings through a shaving die, thus, making the operation of machining a matter of seconds instead of minutes, as it would have been, had the castings been turned up on a lathe. They were making these castings by the thousands and every casting cleaned up. This could never have been done with castings molded by hand, on account of the variation in size, due to hand rapping of pattern to get it out of the sand. The vibrators used in machine molding will always furnish enough "shake" to allow the pattern to slip out of the sand, but will never distort the mold. Machine-made castings are also free from blow holes caused by hand ramming. A machine-jarred mold can always be made harder than a hand-rammed one, and still the metal will "lay to it," simply because the sand is jarred absolutely uniformly, and the gas can pass off freely and evenly, and is not "pocketed" by hand ramming with a "peen" rammer. Also we get away from "joint swabbing." This item alone has been responsible for an enormous amount of scrap, and is entirely eliminated by the use of machines. Incidentally, on this particular job of which I speak, two boys about 18 or 19 years of age, **not molders**, are producing two hundred molds per day, twelve castings in a mold, a total of 2400 castings. Can we do that in the old way?

# The Story of the Spoon

## The Evolution of the Spoon From 2,000 B. C. to the Present Time—Part 1

Written for The Metal Industry By A. F. SAUNDERS, Designer

Did you ever stop to think as you picked up your silver spoon to stir your morning coffee, how many centuries it has taken to develop this simple, yet most useful domestic utensil from the crude wooden or horn scoop of the cave dweller, to the finely proportioned work of art that this important product of the silversmith is today? Study for a moment this little strip of metal. Do you realize that this simple little article of daily use has required the very best in Art and Science to bring it up to its present state of perfection? Can you think of any other article in the home that renders more practical service, or that adds more to the attractiveness of our dining table, than the gleaming silver spoons?

The story of its development is so closely related to the advancement of civilization of the human race that it is possible to trace the story of mankind through its changing of form. The spoon finds a place in Art, Religion and Literature and is conceded to be the oldest of all domestic utensils. While no exact age can be assigned the spoon, the earliest records we have seem to be Egyptian, about 2000 B. C. The word "spoon" is derived from the Anglo-Saxon word "Spon," meaning a chip or splinter of wood, which is proof of the use of this material for spoon making in very early times.

The first spoons were all natural ones, such as the shells found along the seashore. The first step in its development began with the binding of a cleft stick to the shell, thus forming a handle. By this simple combination of bowl and stem, we have the essentials of the spoon, the remaining history of which can be easily followed by noting the variations of these two parts as to form and comparative proportion.

It is rather interesting to note how the taste in the matter of shells reverted back, for in Renaissance times we find rare shells, rock crystal, serpentine and agate being constantly used for spoon bowls mounted to elaborate metal handles. Even to this day, the bowls of many silver sugar spoons are suggestive of a shell in design and are commonly called "Sugar Shells."

Many primitive spoons were carved of wood or horn. These were followed by spoons of ivory, pewter, brass, iron, gold and silver. Examples of old Egyptian spoons made of slate, wood and bone are owned by the British Museum. The finest collection of old spoons in this country is the Avery collection, shown at the Metropolitan Museum of Art in New York City.

Greek, Roman and early Christian Spoons were mostly of bronze or silver. They had round bowls and long slender handles sharply pointed at the top to open shell fish and extract the edible parts. As civilization spread throughout the East, spoons were more generally made of silver, and it was a very poor family that did not possess at least one silver spoon. "In days of old, when knights were bold and barons held their sway," the people carried their spoons about with them as we now carry pen knives. Some of these spoons had a perforated handle to permit of a string passing through, while others had folding handles, either plain or in the form of a fork folded down against the bowl when not in use.

By the end of the 14th Century, the round bowl had become pear or fig shaped, pointed end toward the handle, the stem, hexagonal or square in form, and terminating in a simple knob, while others had animal heads, birds, etc., as an ornamental finish. During the 15th century appeared the "Virgin Head" spoon so called from the use of a bust of the "Blessed Virgin" topping the stem. The first mention of the "Virgin Head" type occurs in a will of the year 1446. They continued in favor until the time of Queen Elizabeth.

Contemporary with the "Virgin Head" spoons were the "Seal Top," the bowl, pear or fig shape, as were all spoons of this period. In fact, this style of bowl did not change until the time of Charles II (1660-1685). The stem of the seal top was a slender shaft terminating in a hexagonal mass somewhat resembling a Gothic Capital. The top was flat and when engraved used as a seal. The so called "Pudsey Spoon" bearing the hall mark of the time of Henry VI is the earliest example of a "Seal Top" spoon now extant. It bears the Lancastrian Rose, badge of this unfortunate monarch to whom this spoon is supposed to have belonged.

Perhaps the best known of old spoons are the "Apostle Spoons." They derived their name from the little figure ornaments that adorned the handle. The idea was in imitation of the heathen tribes who introduced figures of their gods upon almost every utensil.

It was an Old English custom for sponsors at christening to present Apostle spoons to children for whom they answered. The wealthy gave a complete set. The less fortunate, a single spoon with the figure of the Saint in honor of whom the child was named.

Occasionally a thirteenth spoon was added, having the figure of the "Saviour," such a spoon being called the "Master" spoon, and they are now very rare. Only one complete set of Apostle Spoons with the Master Spoon and all of the same date and make is now in existence. This set is owned by the Goldsmith Company of London and bears the date 1626.

The ornamental top of all spoons of this period whether they were "Seal Top," "Virgin Head" or "Apostle Spoons," were invariably cast and were dovetailed into the stem by filing a little "V" shaped tongue. The bowl and stem were hammered out by hand.

The Apostle Spoon is mentioned several times by Shakespeare. Also in Beaumont and Fletcher's, "Noble Gentlemen," one of the personages says to his confidant:

"I'll be a gossip (that is, Godfather) Bewford, I have an odd Apostle Spoon."

During the Commonwealth, the Saints were degraded from their proud position and what is known as the Puritan type of spoon became the vogue. This flat end started earlier on the Continent than in England. Puritan handles end in a sharp "V" where forming the back of the bowl. The stem is broad and flat and the bowl changes from the pear shape to more nearly an egg shape with the narrow end below.

With the Restoration 1660, a most sudden and distinct change in the whole form of the spoon took place. The bowl became a perfect oval, with the handle quite flat. The top which broadened out was cleft into three divisions. This was called "Hind's foot," (Deer's foot) or "Trifid" stem, the top of handle turning upward. The bowl was elongated into a regular ellipse and was further strengthened by a narrow tongue which ran down the back. This feature was vulgarly called the "Rat's tail," which feature continued on practically all spoons up to about 1730.

A modification of the "Hind's foot" appeared during Queen Anne's time (1702-1714). By closing in the two clefts it became the wavy end. The stem also became

thicker at the top giving the impression that the end had been bent entirely over and hammered solid. By the middle of the 18th Century, the "rat tail" shortened up into a short drop. The bowl assumed a long narrow elliptical shape and about this time fashions from France were introduced. Rococo scroll and shell ornaments were used to ornament the back of the bowl. The so called "Onslow Pattern" started the reversion of the curved stem end which now began to curve toward the back (down instead of up). This was followed by the extremity of the handle becoming quite round and a high sharp ridge running down the middle. Beginning with the reign of George III (1760-1820), the spoon steadily became more simple. The high ridge disappeared from the handle leaving it perfectly plain. The bowl now assumed a true egg shape and the style was called "Old English."

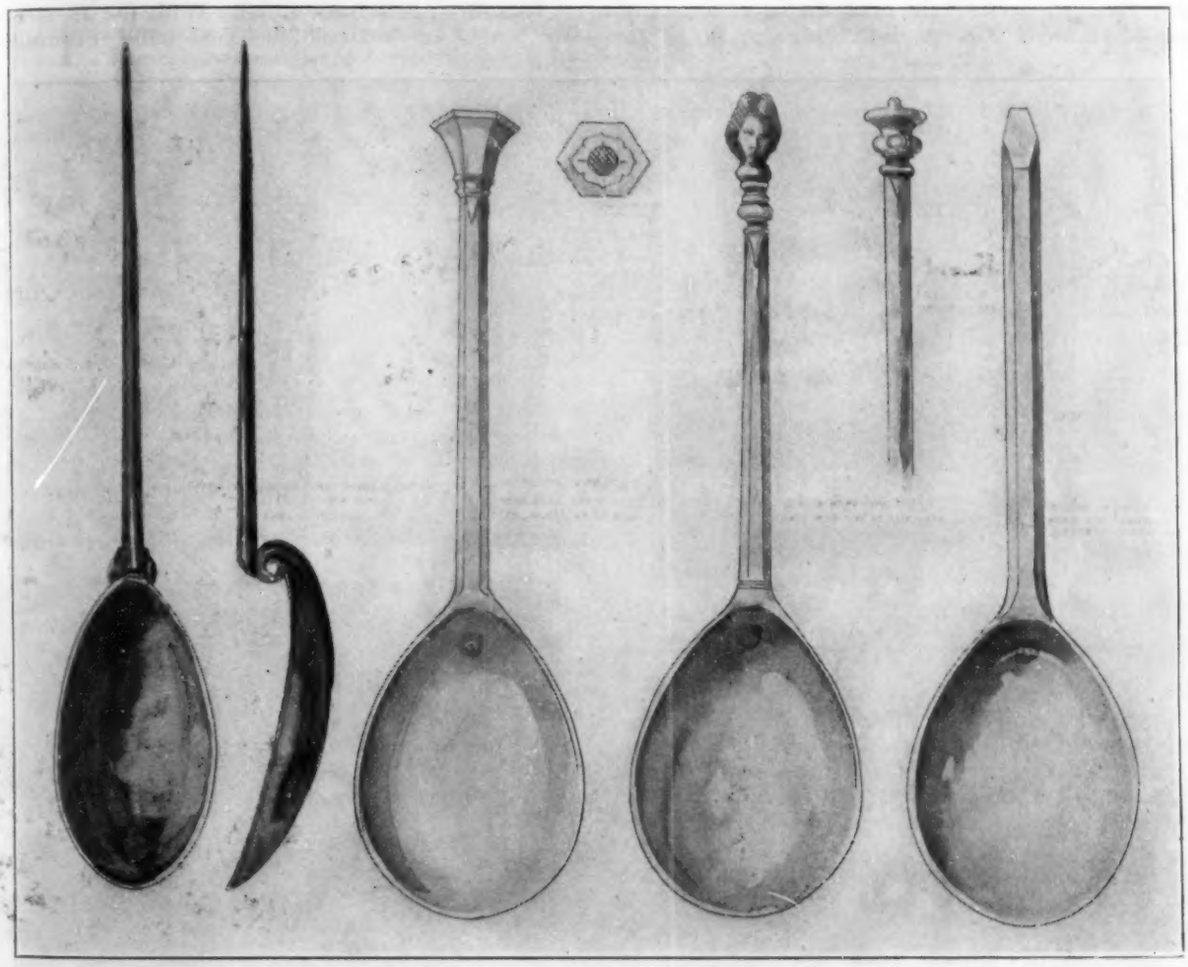
This is really the beginning of the modern spoon as we know it today, as the proportions are practically the same. We vary the shape of the outline and decorate it in a thousand different styles, we turn up or turn down the tip as fancy dictates, but fundamentally, the spoon is the same as the "Old English" type.

Details of the spoons shown in the illustrations are as follows:

No. 9. Mediaeval Bronze Spoon, keel and disc type, early Christian Era, 13th Century. Handle sharp pointed end used to open shell fish. The keel running beneath the bowl and supporting it for about half its length is rectangular in shape and dies away under the center of the bowl, but increases in depth toward the stem, under which it curls up into a disc. The stem is set on the edge of the disc.

**No. 10.** Seal top type of Silver Spoon, 15th Century. The head of its handle is octagonal, somewhat resembling the capital of a Gothic shaft and on its flat top is engraved a single rose, the badge of the King. A spoon of this kind bearing the date 1445 is in the British Museum and is said to have been given by Henry VI together with his boots and gloves to the loyal Sir Ralph Pudsey, at whose seat, Bolton Hall, that unfortunate Monarch concealed himself after the battle of Hexham.

Inside the bowl is stamped the Leopards Head. All Ancient English Spoons previous to the time of the Restoration, 1660, were so marked.



NO. 9 NO. 10 NO. 10A NO. 11 NO. 11A NO. 12

**No. 11.** Virgin Head type of Silver Spoon, 15th and 16th Century, contemporary with the seal top, the stem terminating in a bust of the Virgin. The earliest known example of this type dates from the year 1446.

**No. 12.** So called "Puritan" type of Silver Spoon, also called in heraldic terminology, "Slipped in the Stalks," in 1500, and again as "Sleppe-ended" in 1580. These spoons had the ends of the handle simply cut off at an angle as if they might have once been Apostle's Spoons but had had the figures lopped off, but spoons seem to have been often so made, and were popular for a long period. The date letter is often stamped at the end of

the handle close to the slip end, perhaps to show that it has not been shortened or tampered with.

The Balluster end type of handle shown to the left of figure No. 12, was also a popular type of spoon about the end of the 16th century.

**No. 13.** Trifid or Hinds Foot form of Spoon. The first type of flat handle.

With the Restoration (Charles II) 1660-1685, a complete change occurred in the form of spoons in England. The stem became flat expanding at the top which was cleft into three points, slightly turned up. The bowl changed from the pear shape to a perfect ellipse and was strengthened in its construction by continuing the handle in a tongue or "rat tail," down the back of the bowl.

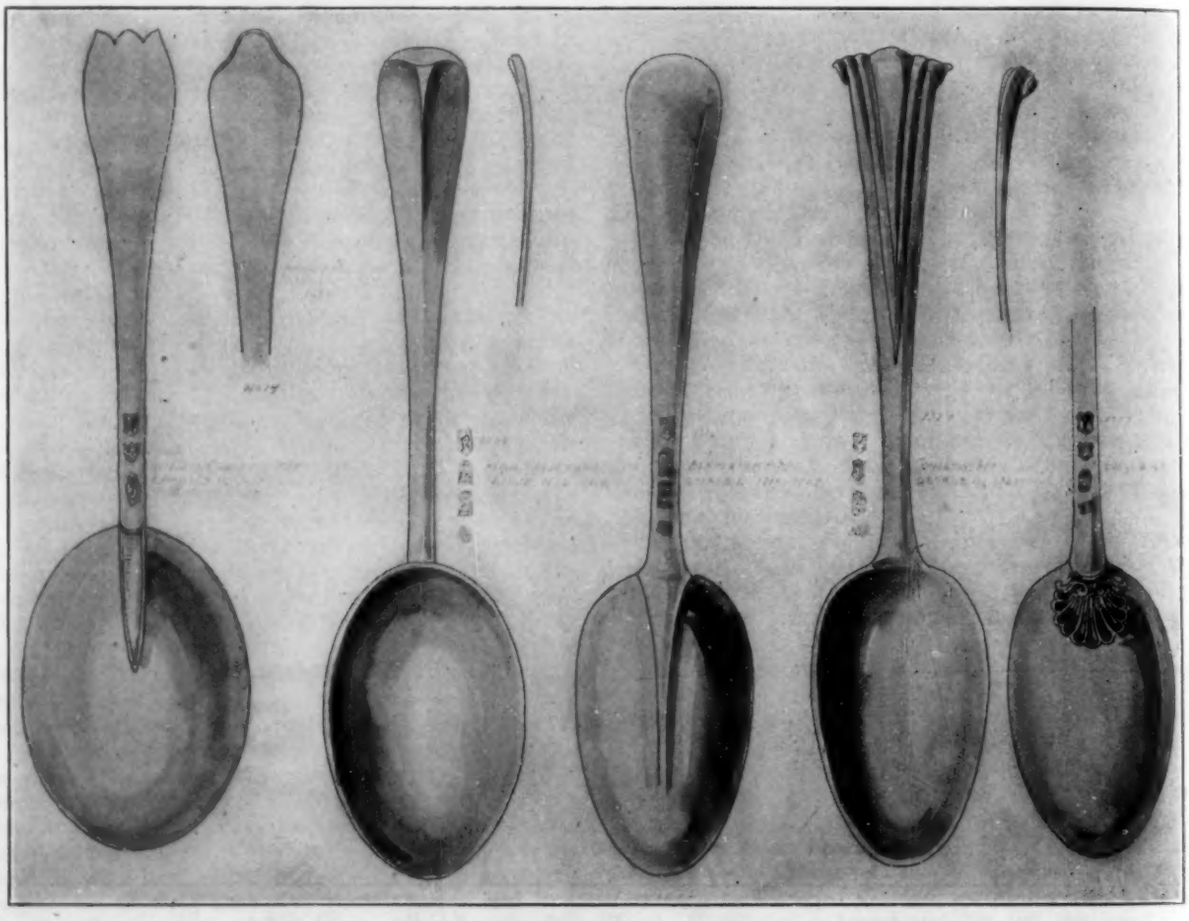
This type of spoon (either as originated or in modification) obtained persistently until the accession of the House of Hanover, George 1st, 1714.

**No. 15.** Ridge Stem, Silver Spoon of Queen Anne's time, 1702-1714. The Wavy end gave way to the round top handle with a ridge running part way down the face of the stem. The top of the handle still turns up and the bowl remained slightly elongated until the middle of the century.

**No. 16.** Plain Stem type of Silver Spoon, George 1st, 1714-1727. The bowl shows a tendency to become more pointed at the end away from the handle. The "rat tail" is still in evidence, and the top of the stem still turns up.

**No. 17.** The Onslow Pattern, time of George II, 1727 to 1760. Like the "Wavy" end a transitional type, which set the fashion for turning the end of the handle down instead of up, and shortening the "rat tail" or tongue on the back of the bowl to a drop.

**No. 18.** Shell Back Bowl. With the shortening of the tongue or "rat tail" shell and scroll ornaments of a



NO. 13 NO. 14 NO. 15 NO. 16 NO. 17 NO. 18

**No. 14.** Wavy End. A transitional condition. By cutting away the outer points the "Trifid" handle becomes the "Wavy" end. The flat stem more rounded in form and the bowl becomes still more elongated.

Rococo character appeared. Needless to say, this style was imported from France.

The next paper will describe the changes in Spoon Patterns from the "Old English" to the present time.

## Hot Nickel Solution

In the March issue of THE METAL INDUSTRY, on page 112, it was stated that Charles H. Proctor, Plating Chemical Editor, recommended a hot nickel solution and gave a formula. The formula as printed was in error. The correct formula is as follows:

| | |
|---|---|
| Water | 1 gal. |
| Single Nickel Salts | 3 lbs. |
| Nickel Chloride | 3 ozs. |
| Boracic Acid | 2 ozs. |

Temperature, 125°-140° F.; 40 amperes per square foot; 6 volts. Use cast nickel anodes.

# The Tarnishing and Detarnishing of Silver

## Causes of Tarnishing and Comparison of Methods of Removal. Properties of Moss Silver.* Part 3.

By G. W. VINAL and G. N. SCHRAMM

### (d) The Relative Tarnishing of Pure and Sterling Silver.

In the experiments described in the preceding paragraphs some indications were found that the ordinary sterling silver, consisting of an alloy of silver and copper, tarnished more readily than the pure silver itself. Because of the importance of this observation and the possible misinterpretations that might be placed upon it, additional experiments were made on a series of alloys containing amounts of copper ranging from 7.3 per cent to 40 per cent. These specimens were prepared for us by

Acid Alkaline

FIG. 12. THE RETARDING EFFECT OF N/5 HYDROCHLORIC ACID AND THE ACCELERATING EFFECT OF N/5 SODIUM HYDROXIDE SOLUTIONS ON THE TARNISHING.

Handy and Harman. They were subjected to tarnishing atmospheres under varying conditions and to the action of tarnishing solutions. Almost without exception the rate of tarnishing of these specimens has been found to be proportional to the amount of copper which they contained. Fig. 15 shows these specimens together with one of pure silver arranged in order of increasing tarnish produced by one minute immersion in a N/10 sodium sulphide solution to which sulphur had been added.

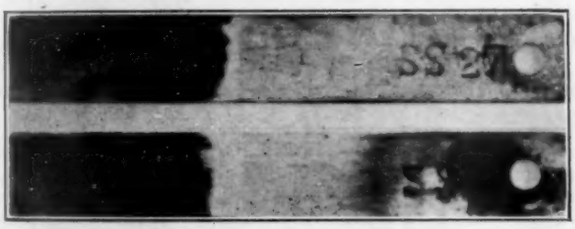


FIG. 13. ACCELERATION OF THE TARNISHING BY SOAP FILMS.
A film of a white soap was used on the upper specimen and a laundry soap on the lower.

The approximate composition of the specimens shown is as follows:

| | | | |
|---|---|---|---|
| S9 | Ag 100% | .... | (fine silver) |
| H1 | 92.7% | Cu 7.3% | (sterling) |
| H2 | 85% | 15% | |
| H3 | 80% | 20% | |
| H4 | 75% | 25% | |
| H5 | 72% | 28% | (approx. eutectic) |
| H6 | 60% | 40% | |

These results indicate that the increased rate of tarnish is due to the copper. Several recent attempts to produce an alloy conforming to the required percentage of silver in sterling silver, but less subject to tarnish, have been made. In view of these facts it should be stated that the desirability of any particular alloy does not rest on its resistance to tarnish alone. Other factors which must be taken into account are color, hardness, tensile strength, malleability, ductility, and cost, beside the results of such practical experience under the ordinary conditions of use as cannot well be anticipated in purely laboratory experiments.

*Published by permission of the Directors of the Bureau of Standards, Department of Commerce. Parts 1 and 2 were published in our issues for January and March, 1924.

### 3. DETARNISHING OF SILVER

### (a) The Electrolytic Method of Detarnishing.

The detarnishing of silver by the electrolytic method is accomplished by the cathodic reduction of silver sulphide. Hydrogen ions depositing on the surface of the sulphide may be the active agents in bringing about this reduction.

$$Ag_2S + 2H \rightleftarrows H_2S + 2Ag$$

It is possible to explain the effect as a reduction process without the deposition of hydrogen by the ionic equations which follow:

$$Ag_2S + 2(-) \rightleftarrows 2Ag + S^{=}$$

$$S^{=} + 2H^{+} \rightleftarrows H_2S$$

The net result is the same in either case. The solution used contained sodium chloride and either sodium carbonate or sodium bicarbonate, the latter being preferred,

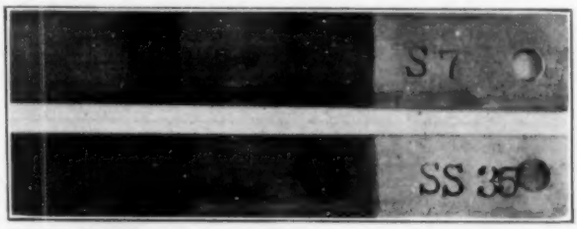



FIG. 14. EXCESS TARNISH CAUSED BY MOSS SILVER
Left ends had been tarnished and then electrolytically reduced before tarnishing in a solution of N/10 sodium sulphide plus sulphur.

although the final products are probably the same in either case. No study of the intermediate chemical reactions has been made since they are of comparatively little importance. The hydrogen sulphide may be detected readily by its characteristic odor when a considerable amount of the sulphide has been reduced. The other

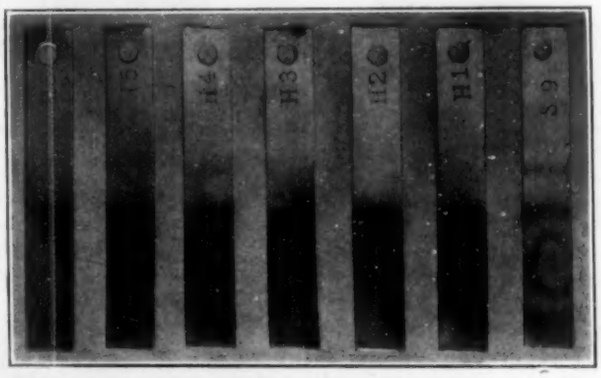



FIG. 15. EFFECT OF A TARNISHING SOLUTION ON PURE SILVER (S9) AND OTHER SPECIMENS OF SILVER—COPPER ALLOYS VARYING IN COMPOSITION FROM STERLING SILVER (H1) TO SILVER 60%, COPPER 40% (H6). SPECIMEN H5 IS OF THE EUTECTIC COMPOSITION.
Because of photographic difficulties H3 appears as much tarnished as H5 or H6, but this is not the case. The colors of the tarnishes were as follows: S9, pale yellow; H1, yellow; H2, yellow with reddish tinge; H3, purple; H4, blue; H5, blue with portions of black; H6, black.

final product represented in the equation as 2Ag may also be observed when very heavy tarnishes are electrolytically reduced. This silver is left upon the surface in the form of moss silver.

**(b) Moss Silver.**

A relatively small amount of sulphur is in combination with silver in the tarnish film. According to the formula for silver sulphide, $Ag_2S$, the relative amounts of sulphur and silver are in the proportion of 32.06 grams of sulphur to 215.76 grams of silver. The sulphur is therefore only 13 per cent of the compound. The silver which forms 87 per cent of the compound does not return to its original crystal structure when the sulphur is removed, but is left on the surface in a moss or spongy condition. If the tarnish is slight the amount of this moss silver is entirely negligible and the bright finish of the silver is unimpaired after the detarnishing process. Greater amounts of tarnish leave perceptible amounts of moss silver after detarnishing that cause a "satin" finish or in exaggerated cases even a dull grey without metallic luster. The polished finish can be restored either by the use of an abrasive to remove the moss silver or by the use of a burnisher. Theoretically there should be no loss of silver when cleaned electrolytically. Practically there may be small losses because of mechanical abrasion of the moss silver.

It is possible to prepare moss silver in considerable quantities by the electrolytic reduction of silver sulphide prepared according to methods previously described.[1]

Fig. 16 shows the sulphide obtained by chemical precipitation as a black powder. This can be fused in the absence of air to a button resembling gunmetal. In this condition it is sufficiently malleable to be hammered into a disc on a hot plate as shown in the lower right-hand

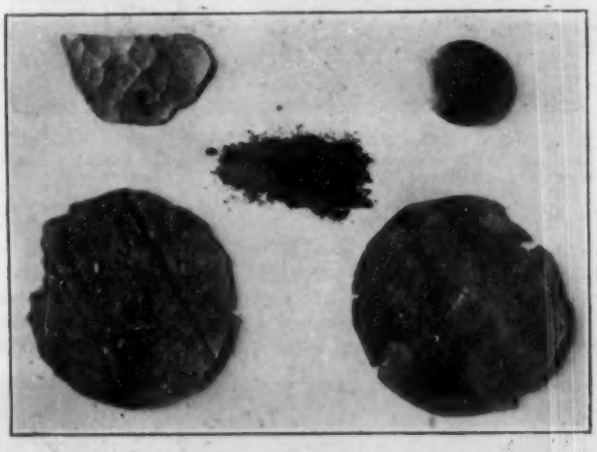


FIG. 16. SILVER SULPHIDE SPECIMENS

The black powder prepared chemically is fused into a button which can be hammered into a disc on a hot plate. Specimen in lower left has been partially reduced to sponge silver.

specimen. By using a commercial silver cleaning device this can be reduced easily to sponge silver, a grey-white fibrous substance which is very porous and somewhat expanded. This moss or sponge silver crumbles easily when handled. The specimen at the lower left of Fig. 16 was not entirely reduced.

**(c) Hydrogen Sulphide Liberated.**

The less important product of the detarnishing reaction is the hydrogen sulphide liberated. A simple calculation shows that the amount of hydrogen sulphide liberated under ordinary conditions will not be objectionable or dangerous.

[1]Vinal, Scientific Paper of Bureau of Standards No. 310, p. 331.

**(d) Electrolytic Cleaning Devices.**

Although any metal anodic in solution to silver might theoretically be used for the electrolytic cleaning process, zinc, aluminum, and tin are those which have found the widest application. A single metal may be used, but some of the commercial devices on the market consist of two or more metals. Tests were made on one of these consisting of a zinc disc with a tinned grid of iron on its surface as well as on discs of the single metals, zinc and aluminum, having the same dimensions, 21 cm. diameter. Small

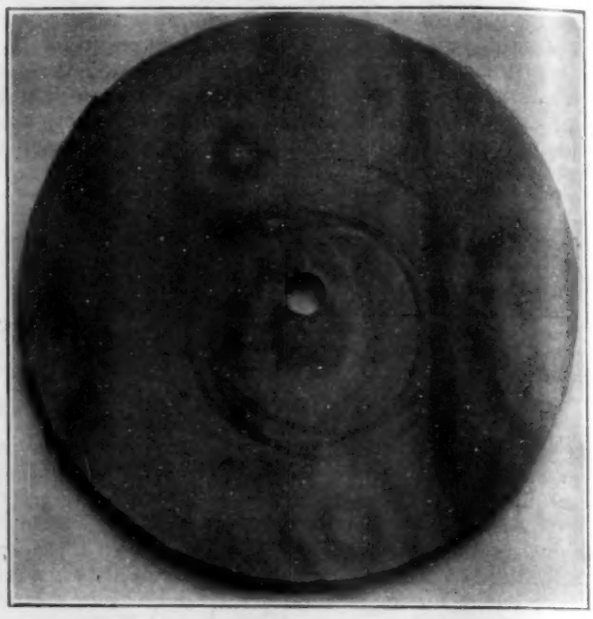


FIG. 17. DISC OF ALUMINUM USED FOR CLEANING LARGE PIECES OF TARNISHED SILVER, SHOWING THE FILM THAT FORMS ON SURFACE, PARTICULARLY NOTICEABLE AT THE POINT OF CONTACT. THE FILM HAS BEEN SCOURED OFF THE RIGHT SIDE OF THE DISC.

sheets of the latter metals are also sold under various trade names.

When the single metals are in use a film of residues and the anodic products of the electrochemical reactions form on the surface and may impair the electrical contact between the silver to be detarnished and the metal of the cleaner. Fig. 17 shows an aluminum disc used for cleaning large pieces of tarnished silver. The rings on the surface show where the pieces rested on the disc. After several had been detarnished the aluminum became inert and no further detarnishing could be accomplished until a portion of the film had been removed. The aluminum becomes brown while in the hot solution and to this is added a gelatinous precipitate, probably the hydroxide, when the solution cools.

The theory of the tinned grid of the commercial cleaner, Fig. 18, is based on the fact that tin being cathodic to the zinc remains free from anodic films. It therefore furnishes a gateway to the zinc that insures good metallic contact with the zinc at all times irrespective of the amount of the electro-chemical products on the surface of the zinc. An experiment similar to that made with the aluminum was carried out with this cleaner, but the amount of tarnished silverware was not sufficient to terminate the action of the cleaner and therefore a more severe test was devised.

**This paper will be continued in an early issue. —*Editor.***

# Diseases of Nickel Deposits

## Symptoms, Causes and Cures. Conclusion.*

Written for The Metal Industry By WILLIAM VOSS, Electro-Plater

The first part of this article covered the causes and cures of black deposits, dark deposits, dull deposits, thin deposits, uneven deposits and deposits of uneven texture. This tabulation completes the discussion of nickel:

| SYMPTOMS | CAUSES | CURES |
|---|---|---|
| **Peeling Deposits:** Deposit is dark and peels. | See dark and dull deposits..... | See dull and dark deposits. |
| | Improper cleaning..... | Use proper cleaner.<br>Remove uncombined oils on surface of cleaning solutions.<br>Use cyanide dips to remove tarnish from brass and steel.<br>Muriatic acid dip for iron and steel to remove oxides and scale. |
| Deposit is good but peels. | Improper cleaning..... | If cleaning solution is old, discard it and make new. |
| | Oil on surface of solution. | Keep surface of plating solutions free from oil and grease. |
| | Tarnished or oxidized surface prior to plating. | Avoid oxidizing or tarnishing surface in process of cleaning. |
| | Heavy deposit at rapid rate. | |
| Deposit is bright but peels. | Solution too acid..... | Reduce acidity. |
| | Too much colloid..... | Avoid too much colloid or brightening agents. |
| | Deposit too fast and too heavy..... | Avoid heavy dense solutions.<br>Do not force deposition too fast.<br>Heavy deposits may be obtained, but do not force current unless agitation is used. |
| | Improper cleaning.<br>Oxidized or tarnished surfaces. | See tarnishing and oxidizing above. |
| **Green deposits:** Deposit, instead of being metallic, is a green (salt) deposit. | This condition is found in solutions made up of single salts (nickel sulphate) when no conducting salts are used and not enough single salts. | If the amount of single salts be increased, a nickel deposit will eventually result. At first the deposit will appear only on high edges and as the addition continues, a fair deposit will be obtained.<br>Such solutions have poor conductivity.<br>Deposit is heavy on edges or high spots.<br>Is brittle.<br>While the deposit may be good on high spots, little if any, deposit is obtained on deep surfaces.<br>A solution that produces a green deposit may be readily changed to one giving fine deposits by the addition of ammonium chloride and boracic acid.<br>This converts some of the single salt to double, depending upon the amount of ammonium chloride used. |
| **Brittle deposits:** Deposit flakes off.<br>Deposit flakes off on lower portions, while upper deposit is fine.<br>Deposit will not stand bending. | Solution too dense.<br>Too much brightening agent. Too much organic acids.<br>Solution too alkaline.<br>Voltage too high.<br>Excess of single salts. | Care must be exercised in the addition of colloids and organic acids. Too much of these will cause the deposit to flake off as fast as it is deposited.<br>Such agents change the structure of deposits.<br>Uneven density will cause an uneven deposit, heavy and brittle at bottom of article; fine texture at top.<br>Reduce density.<br>Avoid too much single salts.<br>Avoid excess acid.<br>Avoid alkalinity.<br>Avoid too high voltage.<br>A solution that might give a satisfactory deposit in 10-15 minutes, might prove very brittle in a deposit of 1 to 2 hours, owing to density of the deposit. |
| **Bright deposits:** Deposits are very bright and lustrous. | The addition of colloids.<br>The addition of organic salts. | See brittle deposits.<br>The texture of bright deposits is not suited for all classes of articles, particularly those that are formed and bent after plating. |
| **Streaky deposits:** Deposit is good, but dark. | Prime cause is dirt. | Clean work thoroughly. |
| Streaks from joints, as hinges, etc. | Porous castings with holes, in which the solution acts upon base metal, causing evolution of H gas, preventing nickel from being deposited. | Use better castings.<br>Keep the acidity down. |
| Deposit cloudy with tendency to streak. | Lack of metal.<br>Lack of conducting salts.<br>Neutral or alkaline solutions. | See cloudy deposits. |

* Part I was published in our issue of February, 1924.

| SYMPTOMS | CAUSES | CURES |
|---|---|---|
| **Pitted Deposits:**<br>Good deposit but pitted.<br>Bright deposit but pitted.<br>Dull deposit and pitted. | The main cause for pitting is excessive density.<br>Take a solution that pits and add acid, increasing its acidity and pitting stops. Why? Because the bubbles are formed so fast that they push one another off.<br>A solution that will work well one day, will pit the following morning owing to drop in temperature which concentrates the solution.<br>Again a solution will cease to pit for no apparent reason, but it is really due to rise in temperature.<br>Pitting does not occur in warm solutions.<br>Pits are always prominent on lower portions of work and very few are found on work near the surface.<br>Pitting occurs in acid, neutral and alkaline solutions that are cold, below normal, or above normal density. | Look to the temperature.<br>If due to drop in temperature, warm solution.<br>Stir solution to make it of uniform density.<br>Note density of bath, and if it is too great, reduce with some water. |
| **Lack of Nickel Deposit.** | No current.<br>Loose connections.<br>Corroded connections.<br>Broken connections.<br>Anodes heavily coated.<br>Too much acid, depositing H gas instead of metal. | Keep conductors clean.<br>Use conductors large enough to carry all the current.<br>Keep anodes clean.<br>Avoid low grade anodes.<br>Reduce acidity with carbonate of nickel or ammonium hydrate. |

# Electro-Plating Research

## A Lecture Delivered Before the Newark Platers on the Work Done by the Bureau of Standards on Metal Deposition

By DR. WILLIAM BLUM

Bureau of Standards, Washington, D. C.

At an informal dinner of the Newark Branch, American Electro-Platers' Society on March 19, 1924, Dr. William Blum of the Bureau of Standards in Washington, D. C., lectured on the subject of the work done by the Bureau on metal deposition. Dr. Blum explained that the bureau had been working for two years on nickel plating. No attempt was made to solve every problem that came up because it was manifestly impossible. However, representative problems were taken up and attacked in order. Blum explained some of these problems.

### ACIDITY

A nickel solution is very sensitive to acidity. Hydrogen is deposited with nickel and since it is present in all water and acids it is an ever-present problem.

The lecturer explained that it is necessary to know the degree of acidity of a nickel solution (which is termed by chemists the hydrogen ion concentration). This is now expressed in terms of pH. In other words the pH is the degree of acidity of a solution. What is known to platers as a good normal nickel solution contains approximately 1 part hydrogen in 100,000 to 1,000,000 parts of solution and has a pH of between 5 and 6. Dr. Blum explained the difficulties of developing a test for varying degrees of acidity and showed experimentally that litmus paper, congo red and other indicators were not sufficiently accurate. He explained the use of a box containing various types of compound colors which could be matched against the solution to be analyzed. Since these colors varied with the degree of acidity the unknown solution could be placed in its position by simply matching it against the color which it most nearly resembled. An article in this issue on page 164 on the Double Wedge Comparator will explain one of the recent methods of quickly analyzing a nickel solution for acidity.

Dr. Blum showed a number of slides on the stereopticon to illustrate other points of interest in nickel deposition. Boric acid and fluorides are used as "buffers" to make the solution less sensitive to acid. A solution with the pH of about 6 has a current efficiency of almost 100, using high current density. Ammonium sulphate is a good conducting salt; boric acid is not.

### THROWING POWER

Dr. Blum showed an experimental apparatus for determining the throwing power of solutions. He defined "throwing power" as "the percentage of improvement which a solution would show over normal conditions," when the amount of metal deposited would vary inversely as the distance between the anode and the cathode. He showed that the nickel solutions should have a low current density and a low acidity for good throwing power.

### ANODES

Chlorides are valuable in nickel solutions because of the fact that they improve anode corrosion and current efficiency. Sulphur is a very injurious constituent in anodes. Electrolytic nickel takes a little higher voltage than the ordinary cast nickel anodes, but at that higher voltage it corrodes very well.

A number of questions were asked and several members were interested in the use of sodium chloride for nickel solutions. Dr. Blum stated that he saw no reason why it could not be used satisfactorily. He gave also, as his opinion, that magnesium sulphate would not be of any advantage to a solution which could not be obtained from other chemicals. He spoke very highly of the nickel chloride solutions except that they were expensive.

The subject of pitting came up and Dr. Blum admitted that not much conclusive work had been done on it. He stated that at times it could be attributed to a low current density or perhaps excess acid. There were also the possibilities of suspended sludge, slimes, air, etc., to cause pitting.

# Salesmanship

## "That For Ways That Are Dark And Tricks That Are Vain"

**Written for The Metal Industry by WILLIAM H. PARRY**

Many are the schemes that originate in the fertile minds of sales managers to dispose of goods with the help of their corps of salesmen, and great stress is placed by some managers on the talking points to be used in bringing to the attention of prospective buyers the great merit of their particular lines. This practice is carried so far at times, that the buyers become bewildered at the claims made by various houses as to the superlative qualities of the many products offered, covering the same line. To sell goods on talking points alone, is a man-sized job, and any salesman who is handicapped with inferior goods and depends on his talking abilities to put them over, is to be pitied. First if he should survive his job long enough to visit a second time those whom he ensnared, his reception by his victims is apt to be either very frigid or red hot, according to their temperament; second, his reputation has suffered to the extent that buyers lose all faith in any claim he may be allowed to make for any other class of merchandise handled by him.

There is such a thing as over-talking the goods offered, many salesmen being so much in love with the music and volume of their own voices as to lose sight of the effect of same on those generous enough to allow them full play in their specialty. Physical exhaustion, due to being talked at for long periods, very often results in the order being held up at least long enough for the recovery of the recipient to a state bordering on normalcy. Although, to be perfectly fair, it is a matter of record in one hick town, not a thousand miles from New York City, there happened the almost unbelievable—the giving of a really big order, due to the physical and mental exhaustion following a long siege of talk by no less than seven salesmen, who were allowed to expatiate on the fitness of their products within decent limitations.

There was a meeting of a town board to take a final vote on the granting of a contract to furnish every house with a water meter, same to be owned and paid for by the town. To save time, the board ordered all the salesmen to be present with their samples, with instructions to confine their remarks to half-hour periods. Some of the salesmen obeyed the edict, and some did not, with the result that at the end of about five hours most of the board were asleep or in a stupor, though the chairman did have vitality enough to announce that the board would go into executive session and ordered everybody to leave the room but the 35 board members.

One of the salesmen, who was the first to address the board, had succumbed to the sleeping sickness so prevalent there and had slid down in his pew-like seat, so was unnoticed when the room was cleared. Then it was the board's turn to talk and most of the hicks took a shot at the various makes of meters, though they were pretty well agreed on two types, because both were beautifully smeared with bronze paint and looked like a million dollars to them.

The salesman who had been sleeping placidly through the long-winded discussion of his fellow salesmen and the very numerous board members woke up and, after gathering his scattered wits together, realizing that quick action was necessary, took a chance at a long shot and, in the gloom of a fast-vanishing day, moved the adoption of his make of meter. The board members, tired to the point of recklessness, little realizing what they were doing, and caring less, supposed he was a bona fide board member **and voted to buy his goods.**

The next day two of the board members met on "Main Street" and one asked the other as to the identity of " that feller who made the motion to buy." The reply was, "I don't know, but he looked to me like one of those darned salesmen but it was so dark I couldn't just make out." So they both enjoyed a very hearty laugh and let it go at that.

A sales manager in charge of a large slice of territory south of the Mason and Dixon line, conceived what to him was a brilliant scheme to corral a goodly portion of that trade using goods similar to those made by his house by tacking the word "Dixie" thereon, and it worked successfully in **that** territory. But, in the hurry incident to filling a large order to be shipped to a point very much north of the cotton belt, a portion of the shipment included the Dixie brand. That portion of the shipment was shipped back, and a very caustic letter received by the shippers to the effect that they believed that our country was a united one and branding goods that tended to incite feelings other than unity was not good business for responsible houses to cater to. As the word Dixie was cast in big letters on the most prominent casting of these machines and had to be chipped off by mechanics, the profits on that order were lessened somewhat and, fearing the effect of this hatred-inciting name on other Northerners, the title was discarded for all time.

Lest some of the readers may infer that this happening occurred just after the finish of the Civil War, I will state that 1916 was the year, or about 51 years after Lee surrendered at Appomatox.

In a pretty fair sized town down East, the public utilities board of five members had, by a vote of three to two, awarded a contract to furnish their fair city with some 8,000 water meters to a reliable concern whose price was the highest of all those competing for the order. All but one of the competitors accepted defeat gracefully and withdrew from the field, satisfied that everything was open and above board. Not so the lone, disgruntled concern's representative or salesman, who hired an attorney to start court proceedings to enjoin the awarding of the contract, as same had been awarded to the highest bidder. He went further, by enlisting the services of a yellow newspaper whose glaring headlines proclaimed their belief that graft had been paid, and demanding an investigation headed by the mayor of the town.

It seems that while the board had the power to award contracts, all such instruments to be valid must be signed by the mayor.

That personage, with an eye for his political future, though knowing full well that the board had acted conscientiously, refused to disgrace the instruments by placing his signature thereon. As a result, the town took sides and such a rumpus was raised by this poor loser that, in the end, the board's action was nullified and the goods bought here and there in small lots as needed.

Any salesman can accept a victory smilingly, but it takes a real good one to take a defeat and work all the harder on the next proposition.

A salesman known as "the Ten Thousand Dollar Beauty" by his trade had earned the right to be called such by his ability to command that amount in salary. As a seller of goods he was regarded as the leader in his line, and rightfully so, yet he received no encouragement from the concern with whom he started, though closely related to its president, and had to seek employment from a competitor. There he established such a reputation that every sales manager and salesman employed by competing concerns were up on their toes when this baby was on the job, as evidenced by one instance that occurred in a Southern town famous for its alcoholic drinks and terrapin.

A large contract was to be awarded and all the water meter concerns in the country were mighty busy, working with might and main night and day and spending all kinds of money in entertaining officials and help even remotely connected with the water department. Tests were being conducted of all types of water meters and the supposition was that although the inhabitants of that town did not drink much water except as "chasers," the meters must register accurately. Special pains had been taken to send sample meters there that were so fitted that they would register the sweat on their dial glasses. Not only sales managers and salesmen were cluttering the hotels of the town but engineers and even presidents of companies had been called there to help land the order.

Strange to say, the "Ten Thousand Dollar Beauty" arrived in the town a few hours before the awarding of the contract, and it was noticed that in his company when he arrived were enough members of the water board to more than constitute the necessary two-thirds of that body's votes. The "Beauty," sensing that his competitors were capable of pulling off most any old trick, had, through the goodness of his heart, invited every board member to be his guests on board a chartered yacht, to remove them from temptation. The entertainment he furnished to the party was lavish in the extreme. His company was awarded 90 per cent of the whole contract, the remaining 10 per cent being distributed among three other concerns, they being the next-best spenders, regardless of the fact that the accuracy tests of the four winning companies were the lowest and most unreliable of all the meters tried out.

There is a type of salesman abroad in our land known as the gossiper, his specialty being to carry news from one customer to another, as to what each may be doing in the line of experiments or new stunts of production. This class of salesman is dangerous, and does not, as a rule, last very long as such. Many of them are lame duck mechanics, who become inspired with a desire to outsell any ordinary salesman because of their mechanical experience. On being allowed the free run of places they visit they appoint themselves advisers as to methods far in advance of anything prevailing at any manufacturing plant.

One of these gentry, being ordered out of a plant by the man in charge, took it upon himself to write a long letter to the president of that company, in which he claimed that, while their equipment was pretty good, the heads of departments, from the manager down, were incompetent and should be removed. As a result of this little play on his part it is recorded that a removal followed, but the salesman was the one removed.

Salesmen are not always at fault for the troubles they make for the buyers by selling them their line of goods to the complete exclusion of all other lines. For a buyer to tie up to one line, may it be ever so superior to anything else offered, can have serious consequences, as the following instance proves.

A water company supplying a thriving and fast-growing city in the Middle West, had from the very first been buying one line of water meters and every little thing went along lovely until the World War came along with its high cost of labor and materials. The manufacturers of that particular meter, when an order was received from the water company for a large number of repair parts, succumbed to the urge to charge almost triple prices for that shipment and, as nothing was heard from the buyers, it was supposed that war market conditions were understood by them. In that, however, they were mistaken, for, when another order was received from the same water company, it was accompanied by a letter in which they were notified that because of the enormous and conscienceless increase of prices for the last order for parts, that this was the final order to be expected from them for two reasons; first, that they now realized what had often been pointed out to them by rival salesmen, that it did not pay to tie up to one line of goods; second, any concern that would take advantage of abnormal conditions to charge more than 50 per cent over former prices was not to be trusted. They further explained that they were fully conversant with non-ferrous metal prices and wage rates current in the East just then but, not by any stretch of even a nimble imagination, could they conceive any justification for the prices charged for the last lot. In the future, they would not confine their buying of new water meters to any one company.

Many salesmen, in their eagerness to make a sale, will unload unsuitable goods on an unsophisticated buyer, thus qualifying as members of the "Smart Aleck" fraternity, little realizing the future consequences of such an act. In a little town in Maryland, whose mayor was the Pooh Bah not only of that town but the county as well, a very verdant salesman talked this overlord into buying a large water meter of the compound type, by which is meant a fluid-measuring machine capable of registering with more or less accuracy large and small streams of liquids. Such devices are designed, in the main, by combining current and positive displacement measuring chambers in the one body, so that the liquids are directed to either, and sometimes both, according to the volume used. Knowing this, the salesman talked the mayor into buying a compound meter because his sales totals would be increased thereby.

No sooner had the meter been installed when the trouble started. The chief and only service this meter was to be used for was to supply the steam locomotives of two railroads, hesitating in the town long enough to take on sufficient water to enable them to leave it. As this expensive meter was equipped with two registering clocks, it did not take the mayor very long to find out that but one end of the machine was doing all the work, so he wrote to the manufacturers to send someone down there to take out the silent partner and make an allowance in the price.

To make a long story short, no less than three experts were sent in succession to tinker with the meter and the temper of the mayor. The last of this precious trio took out that part of the device that "toiled not, neither did it spin," which entitled the mayor to one more rake-off, and to close the incident much to the discomfiture and expense of the concern manufacturing that type of meter.

# THE METAL INDUSTRY

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# EDITORIAL

## BUSINESS CONDITIONS

Even the general public was startled and deeply interested to hear that the United States Steel Company had in 1923 done a larger business and made greater profits than in any peace-time year of its history, accept 1920. The actual figures, the meaning of which depend largely upon the reader's knowledge of the history of this corporation, show that it did a gross business in 1923 of about $1,500,000,000 or approximately $500,000,000 more than 1922. The net earnings equalled $16.43 a share of common stock after the preferred dividend.

The record of the United States Steel Corporation is always of interest to the business public in that it is an indicator of the general conditions prevailing throughout the country. To the metal trades, it means that when the buyers are purchasing steel, they are manufacturing equipment and commodities which call for metals as well, and for that reason business is likely to be good. This is borne out by the statement of the National City Bank in its monthly publication for April 1924. It is stated that permits and contracts indicate that as much construction work is under way as a year ago, and this in the face of costs somewhat higher. The railroads seem to be the leading factor in the consumption of heavy output. Makers of farm implements are said to be fairly cheerful over their outlook, although no startling developments can be expected as yet in any lines which cater to agricultural interests. There has been some heavy purchasing by automobile interests who seem to be confident of a large and prosperous season. This is encouraging, but it has been rumored recently that the automobile production will perhaps be not so good in 1924 as it was in 1923.

It is to be expected that 1924, being a political year, will show some fluctuations but will hardly go as high as 1920. On the other hand, it should not drop as low as 1921 or 1922. If business men keep their heads level and do not fall into the mistake of undue optimism or pessimism, we shall go along as we did the past year; carefully but steadily and business will remain good.

## METAL RESERVES

From time to time questions are brought up of the reserves of raw materials which are seemingly indispensable to the welfare of the human race, and if it were not for the fact that somehow or other we keep on managing with or without the necessities, there might be considerable ground for anxiety. One of the recent possibilities brought to our attention is the decrease in the available supply of metals, and the possibility of their complete depletion. Professor Thomas Turner, in his presidential address before the British Institute of Metals in London, March 12, 1924, pointed to the fact that the British Isles, long among the leaders in the production of copper, tin and lead, are now quite unimportant in this respect. It seems that other nations have come to the front as producers of copper and lead, notably the United States. The British Empire, however, still holds first place in the production of gold, tin and nickel, but these of course, come from its colonial possessions—South Africa, the Straits Settlements and Canada, respectively.

Professor Turner pointed out that Sir Thomas Holland predicted the exhaustion of the known base metal supplies of the world at the present rate of consumption in a comparatively short time, and that a shortage of supply might be expected within the lifetime of persons now living.

It is always dangerous to make dogmatic predictions. The facts are that the actual supply of metals in the earth's crust is far from exhausted. It is simply that the deposits of such concentration as to be economically extractable under present methods is limited. There is every likelihood that as these continually richer deposits are entirely exhausted, new processes will be developed to take care of the poorer ones. At least that has been the history of mining and ore metallurgy to date. There is no scarcity of base metals in the earth's crust or for that matter of rare metals either. The difficulty has been with methods of extraction. It is along these lines that science and industry should work hand in hand to keep the wolf of metal scarcity from our door.

## ELIMINATING USELESS LINES

The Division of Simplified Practice of the Department of Commerce has made recently some interesting reports. According to William A. Durgin, head of this Division, during the last quarter of 1923 ten industries have put into effect eliminations and simplifications that covered a vast number of varieties of their products. In the building industries 73 types of brick were eliminated; 17 types of hollow tile and 101 types of metal laths were dropped; in addition, 117 types of range boilers out of a total 1,300. This list can be continued at length but it is only necessary to mention a few of the industries to show the magnitude of the work accomplished and still projected. Building brick for road work, beds, springs and mattresses, milk bottles, woven wire fencing, chinaware, lumber and various others have benefited by simplifications and the elimination of unnecessary types and sizes.

Recently a meeting was held of the manufacturers, distributors and consumers of brass traps used in plumbing and this meeting adopted recommendations for the reduction of sizes, types and materials from 1,114 to 72. The meeting was attended by representatives of the various industries concerned and some interesting resolutions were adopted, as follows:

1. All traps to be furnished less connections.
2. All traps to be stamped with name of manufacturer and gauge.
3. All gauges to be eliminated except No. 20 B and S and No. 17 B and S. (Every effort to be made to bring practice to the use of No. 17 gauge minimum.)
4. All crown vented traps eliminated.
5. All traps made in accordance with special city codes such as Kansas City, Los Angeles and Cleveland, to be eliminated.

Complete information can be obtained from the Division of Simplified Practice of the Department of Commerce, Washington, D. C.

It is gratifying to know that the Department of Commerce is co-operating so actively and to such good purpose with manufacturers. In addition, Secretary Hoover has announced that the Department will continue to receive and publish information from trade associations in spite of the difference of opinion between himself and former Attorney-General Daugherty. The Department does not express any views as to the legal status of the associations from which it receives data, leaving this entirely to the Department of Justice, but will continue to co-operate with these associations and to help them in every way within legal limits.

## PRIZE AWARDS FOR PLATERS

In the March issue of the Monthly Review is an announcement by John E. Sterling, Supreme President of the American Electro-Platers' Society, to the effect that the following plan has been adopted:

1. A committee of five is to be appointed by the Supreme President, to be known as the Exhibits Committee of Award, to decide upon the winners of the first, second and third prizes of the finished products contest.

2. The prizes for the contest is to consist of certificates of award, of the first, second and third class, to be known as the Gold certificate, Silver certificate and Bronze certificate.

3. This committee and another committee, in conjunction with the second Supreme Vice-President, are to act as a Prize Medal Committee, to decide the winners of a gold medal to be known as the Founder's Medal, this medal to be awarded for the best paper or process that shows a distinct improvement over what is now known in commercial practice. This medal will be recognized (as is the universal practice in all educational institutions and societies) as the highest award. This medal is to be awarded to any member, whether he is a winner in either one of the prize contests or not.

4. The basis to govern the award of the Exhibit prizes is to be not only the best and most valuable to the Society, but also the most economical and efficient method of turning out the work or product commercially.

5. The basis to govern the award of the prizes for the papers presented should be, the most valuable idea, or information contained in any one paper or part of a paper presented at any Branch meeting, Branch banquet or published in the Review during the fiscal year, or presented at any of the educational sessions of the Annual Meetings.

6. The awarding of the prizes or the announcement of the winners is to be made by the retiring Supreme President, immediately after the newly-elected officers are installed. This to be an annual event.

7. To finance the above, a Research Fund will be created and maintained by:

(a) A yearly donation from the Supreme Treasury of $125 per year.

(b) A yearly donation of at least $5.00 per year (or more if they can afford it) from the Branches, and by donations from individuals and from the manufacturers of plated products, as well as from the manufacturers of and jobbers in plating supplies and equipment. Out of this fund is to be paid the cost of printing the certificates, of procuring the gold medal, which will be of a standard design; also the expenses of the Supreme Research Committee.

Credit for this plan is given to Messrs. Lamoureux and Proctor. We heartily recommend that our readers compete for these prizes. It is not a fact that only a few can win; only a few can receive certificates and only one can receive a medal, but everybody can be the winner by the benefits of the publication of so many improved methods and novel ideas. Although a medal or a certificate may be the immediate incentive, the greatest benefits will be derived from the stimulation of ideas throughout the ranks of the electro-plating profession, and the consequent improvement of the industry.

# CORRESPONDENCE and DISCUSSION

**Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein**

## WORKING ON COMMITTEES

At a recent meeting of an important committee of an important national technical society a song was sung. The following are stanzas taken from said song, which will answer all those who are acquainted with the labors of committee work, also those who know the progress of the metal industries. The Editor has been requested to state that a copy of the song fell into his hands "accidentally," and from an "unknown" source.

### IN THE SWEET BY AND BY

(Air: "The Bowerie")

1.

I remember there was a time
When testing materials was a crime;
Committees committeed and that was all,
Then adjourned to return at the chairman's call;
No one was honest who made the stuff;
Specifications were only a bluff;
But now we never do anything rough—
We never go wrong any more!
Committees, Committees!
They say such things and they do strange things
In committees! committees!
They never go wrong any more!

2.

Think of the fussing we had with plates—
Sizes, dimensions and shipping weights.
Now that it's settled we wonder why
We formerly passed the solution by.
We abolished dimensions and—what was hard—
All biting and tripping and gauging were barred
(In which some members at that time starred!)
We never go wrong any more!
Committees, etc.

3.

In modern structures the corner stone
Consists of the yield point and that alone;
Design has been carried to such a length
We never need think of the tensile strength.
The truth of the matter, so long concealed,
By genius discovered, now stands revealed—
The substance itself knows the time to yield!
We never go wrong any more!
Committees, etc.

4

All the troubles we used to feel—
Making brass or manure or steel,
Double conversions and testing hay,
Making analyses night and day—

Have ceased to exist since we got awake
And quit our old jobs as a senseless fake—
Specifications are all we make!
We never go wrong any more!

5

Olden day standards were rule of thumb,
Can't conceive now of people so dumb,
Pipe now has limits both outside and in
With other requirements that would drive one to sin.
This the results of the Committee's hard work,
There is no requirement from which they would shirk.
The cure for this the "Judge" would say—
"Just work for six hours a day."
Committees! Committees!
They say such things and they do strange things
In committees! committees!
They never go wrong any more!

## BRITISH BRASS FOUNDRIES

To the Editor of THE METAL INDUSTRY.

I thank you for your letter of February 27th, calling my attention to an article under the above heading in your February issue.

It is unlikely that the Institute will take any action in the matter in view of a statement made by H. Cole Estep, Chairman of the Committee on International Relations, American Foundrymen's Association, to the effect that "no such person as Thomas Harper was a member of the American Foundrymen's Association party which visited Great Britain, and had such an unusually enjoyable trip last year, nor can I find that anyone by the name of Harper is a member of the American Foundrymen's Association.

"All of the members of the American delegation who visited this country last summer are absolutely unanimous in their feeling that they could not possibly have been received with greater courtesy, generosity, or given greater opportunities to investigate British foundry and manufacturing methods."

Mr. Harper appears to have been traveling about this country in an individual capacity and many of us (including myself) in this country—to our regret—were not honored by a visit from your contributor.

Yours very truly,
G. Shaw Scott
Secretary and Editor
The Institute of Metals

London, Eng., March 18, 1924.

**It should be stated in fairness to Mr. Harper, whose article on Impressions of British Brass Foundries appeared in THE METAL INDUSTRY for February, 1924, that at no time did he claim to be a member of the American Foundrymen's Association Party. He was frankly traveling as an individual.—Ed.**

# New Books

**Electro-Metallurgy.** By MacMillan & Cooper. Published by J. B. Lippincott Co. Size 5½ x 8½; 449 pages, illustrated. Price, payable in advance, $9.00. For sale by THE METAL INDUSTRY.

This is a new edition of the old standard work on Electro-Metallurgy which needs no introduction. The book, as before, embraces the application of electrolytic processes to the plating, depositing, smelting and refining of various metals and to the reproduction of plating surfaces and art work, etc.

Since remarkable progress has been made in the electro-deposition of various metals, the new edition includes discussions of this work, which necessarily could not appear in the old. Among these developments are the electro-deposition of cobolt, the electrolytic abstraction of zinc and much information on copper refining. As a matter of fact, a whole new chapter on the Electro Deposition of Copper is added, as are also additions to the chapter on Electro Metallurgical Extraction and Refining Processes.

The work needs no extended description or praise since it is too well known and has too long been a standard text book. No metallurgical library should be without it.

**Notes on Chemical Analysis,** by Archibald Craig. Published by Chemical Publishing Company. Size 6 x 9—162 pages. Price, payable in advance, $2.50. For sale by THE METAL INDUSTRY.

This is a book which makes no claim to being a comprehensive treatise on analytical chemistry, but is simply a compilation of notes gathered by the author during his long experience as a chemist, embodying methods of laboratory practice and operations which he has found valuable and which, moreover, are not to be found in other text books.

The work covered is as follows:

Glass working, including apparatus and tools, balance and weights, calibration of glass apparatus and a table of corrections for glass which is at the present time no longer in print in any other work.

Tabulation methods for chemical calculations; problems; also corrections for metallics in ore assay work.

Fundamental operations in laboratory work, such as filtering, washing, evaporation, alloy treatment, etc.

A general scheme of qualitative analysis as found useful and practicable by the author.

Determinations and separations of a number of metals.

The book is useful, particularly to the chemist, who will learn a great many new methods and devices as short-cuts in his work. It is also useful for the student who wishes to become an adept in analytical work in the shortest possible time.

**Theoretical Metallurgy.** By Reginald Scott Dean. Published by John Wiley & Sons, Inc. Size 6 x 9; 246 pages, illustrated. Price, payable in advance, $3. For sale by THE METAL INDUSTRY.

There is an unusual volume by the Chief of Metallurgical Department, Hawthorne Works, Western Electric Company, which attempts to apply the latest theories of physics and chemistry to metallurgy. The book was written, it is stated, in response to the demand for a revision of the author's translation of Schenck's Physical Chemistry of the Metals. So much has happened in the realm of physical chemistry that it was necessary to write an entirely new book.

The author discusses various properties of metals such as electrical, mechanical and surface phenomena. He discusses also the properties of metallic compounds and alloys in the same way. Metallurgical processes are then taken up and divided into processes involving electrical properties, mechanical properties and surface phenomena, again. Then come chemical reaction processes of various sorts, such as oxidation and reduction in their numerous forms.

The book is, of course, intended for the chemist or metallurgist. This does not mean that it should not be read by the foundrymen, but unfortunately works of this kind are not read by said foundrymen as much as they should be. Its great value lies in the fact that it explains scientifically so many of the things which go on in the crucible and furnace. It seems obvious that a knowledge of these processes is not only interesting because it satisfies curiosity, but valuable in that it leads to discovery of new facts which could not be found otherwise, except by accident.

## GOVERNMENT PUBLICATIONS

**Copper in 1922** (General Report), by H. A. C. Jenison, U. S. Geological Survey, Washington, D. C.

**Rolled Zinc in 1923,** by C. E. Siebenthal and A. Stoll, U. S. Geological Survey, Washington, D. C.

## RARE METAL ANALYSIS

BULLETIN 212. Bureau of Mines, Washington, D. C. Analytical methods for certain metals, including cerium, thorium, molybdenum, tungsten, radium, uranium, vanadium, titanium, and zirconium, by R. B. Moore, S. C. Lind, J. W. Marden, J. P. Bonardi, C. W. Davis, and J. E. Conley. 1923. 325 pp., 1 pl., 4 figs. 40 cents. An exhaustive treatise. Discusses all methods that have been recommended and gives approved methods in detail.

# SHOP PROBLEMS

**IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE**

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

## HIGH LEAD BRONZE

Q.—Can you give me any information in regards to holding a large percentage of lead in bronze castings of the following mixture:

| | |
|---|---|
| 67% | copper |
| 25% | lead |
| 8% | tin |

A.—If you will make your alloy as follows, it will help you considerably. Melt 66 lbs. of copper and add 1 lb. of 30 per cent magnesium copper; then the lead a little at a time and stir well; then the tin—stir well. Pour in ingots and remelt. For the best results, use plaster paris as a cover on the metal when melted. W. J. R. Problem 3,215.

## JAPANNING SAFETY PINS

Q.—How can we japan small safety pins? We want a smooth finish without taking the spring out of the pin.

A.—Any good japan manufacturing company can provide you with japan for your purpose and full instructions as to its use.

If the safety pins are made from brass, they will have to have a preliminary black coating put on them by an oxidizing process. For this purpose use the following solution:

| | |
|---|---|
| Water | 2 gallons |
| Aqua Ammonia, 26% | 1 qt. |
| Carbonate of Copper | 16 ozs. |
| Sal Soda Crystals | 8 ozs. |

Add the water last. Temperature 180° F.

Before blackening, the brass goods must be perfectly clean and free from oxidation. C. H. P. Problem 3,216.

## MELTING PHOSPHOR COPPER

Q.—We are making a phosphor bronze which should show the following analysis: 79 to 80 copper; 9½ to 10 of tin; 9½ to 10 of lead; ½ to 1 per cent of phosphorus. But we simply can't seem to get it, that's all. Our method of working is to begin with a newly lined 42" furnace (Hawley Down Draft), and to start with 600 lb. heats, all new metal.

First we put a little green wood in the bottom of the furnace. After heating up we put on our pig copper and half of our guaranteed 15 per cent phosphor copper, which we use to get the amount of phosphor called for. We get the metal up to 2,100° F., add the rest of our phosphor copper, tin and lead, pole well with green hickory poles, turn our heat on the furnace and take out at about 2,000° to 2,100° F. This is poured out into one ladle, brought to the molds and poured at about 1,700° F., using a pyrometer. We pour 5 to 7 molds, stirring well before every mold, and here is the result. We get 79 to 81 copper; 7.55 to 8.50 lead; 7.50 to 8.50 tin, which, of course, is not satisfactory. Also will add that out of each heat we pour last a bushing 6 in. in diameter, 6 in. deep and 1½ in. thick which is broken when cold and the drillings are taken about 1 in. from the top and 1 in. from the bottom of the bushing.

A.—From your letter you appear to be doing everything that is necessary to insure the best results. I have no criticisms to make, except the poling of the metal with a green hickory pole.

Let me ask you one question, before saying anything about the poling. Do you make slag in melting your metal? If not, your melting practice is O. K. If you do make slag, your melting process is at fault in that you are running an oxidizing flame. We would suggest you refer to THE METAL INDUSTRY for March, 1922, page 105, for answer to correct method of operating the Schwartz open flame furnace.

Now assuming your furnace conditions are correct, one of the methods of removing lead and tin from copper, is the poling process. This method is used in refining copper and removing other metal. It occurs to us, possibly this is what you are doing, oxidizing the tin and lead to form a silica of lead with your slag and skimming it off. We have seen slag from the open flame furnaces run 15 per cent tin and lead.

A small amount of poling should not hurt your metal and will not, but over-poling will result in a loss of tin and lead in your mixture. We suggest you use a rabbling iron coated with clay for stirring your metal. Also, see that your scales are correct and the tin you are using not less than 98 per cent tin, if you want the correct mixture or analysis. W. J. R. Problem 3,217.

## OPERATING A NICKEL PLATING PLANT

Q.—We have recently installed a nickel plating department and would be pleased to have you recommend method which would cover this subject in the best manner.

It is our intention to establish the technical control of the plating department and would appreciate any suggestions you may have along this line. Our work will comprise the nickel plating of steel and cast iron, using a first coating of copper. We also have a small quantity of aluminum die castings which we are nickel plating direct.

There has been considerable agitation in plating circles occasioned by Professor Baker's statements as to the desirability of plating nickel at high current densities. Can you tell us where this process is used and to what degree it is successful?

A.—In efficient control of electro-plating solutions, chemical analysis of the solutions should be made two or three times a week. In the preparing of a plating solution, the most efficient formulae should be used. A check can be made upon such solutions by analysis.

To standardize the deposits, the current density should be determined per square foot of surface area, and the time necessary to produce the standard deposit. The solutions should be replenished each day to keep them up to your standard based upon the original formula used in their preparation.

Professor Baker, of the University of Michigan, has chemical supervision of the several plants in Detroit. Hot nickel solutions are used based upon formulae used by the U. S. Government in the preparation of printing plates. These plates are built up of layers of copper and nickel alternately. The nickel solution used by the Government is composed of the following:

| | |
|---|---|
| Water | 1 gallon |
| $NiSo_4$ 7 $H_2O$ | 32 ozs. |
| $NiCl_2$ 6 $H_2O$ | 2 ozs. |
| $H_3$ $BO_3$ | 4 ozs. |

These proportions have been increased to

| | |
|---|---|
| $NiSo_4$ 7 $H_2O$ | 3 lbs. |
| $NiCl_2$ 6 $H_2O$ | 3 ozs. |
| $H_3$ $BO_3$ | 2 ozs. |

Temperature of solution 125 to 140 F.; cathode agitation, preferably vertical motion. Solutions of such high metal concentration allow high current densities 25 to 50 amp. per sq. foot of surface area. Furthermore, the increased temperature and vertical cathode agitation liberates hydrogen which would otherwise deposit with the nickel. Hydrogen-free nickel is malleable and ductile and permits the production of heavy nickel deposits in one-fifth of the time consumed with the ordinary normal nickel solutions. The Edison Electric Appliance Company has been using high density hot nickel plating solutions in its Chicago and Ontario, Cal., plants for several years. The nickel deposits produced are so malleable they can readily be hammered on the steel surface. C. H. P. Problem 3,218.

## PLASTER MOLDS

Q.—Can you give any information on plaster of paris molds for bronze?

A.—Plaster of paris molds are not successfully used except for an alloy containing aluminum, such as

| | | |
|---|---|---|
| 60 | ..... | copper |
| 39½ | ..... | zinc |
| ½ | ..... | aluminum |

The mold mixture consists of 90 per cent plaster and 10 per cent lime. The molds are poured and baked in specially designed ovens and thoroughly dried. They make very fine castings. However, for bronze that cannot contain aluminum, it has not been a success. W. J. R. Problem 3,219.

## RAPID SILVER SOLUTION

Q.—Would like to get a formula for a quick plating silver solution. We intend making a 75 gallon solution for large pieces, about two articles in the tank. We must have a solution that is fast and white, as the articles are to be brushed and blacked. We would also like to know how to fix an old silver solution (now working) that reads 4 and is very sluggish, anodes becoming black at the end of the day. Anodes become black while plating and if left in solution without plating, immediately become white; also the stronger the current the blacker they get. We have tried building up the solution by adding silver, dissolved in a regular way with nitric acid, and precipitated with salt and added cyanide. But this did not raise the reading any. Would you advise buying a ready made solution, or making it?

A.—The following formula can be used in preparing a very successful silver plating solution:

| | | |
|---|---|---|
| Water | ..... | 1 gallon |
| Sodium Cyanide | ..... | 4 ozs. |
| Silver Cyanide | ..... | 3 ozs. |
| Potassium Carbonate | ..... | ½ oz. |
| Sal Ammoniac | ..... | ⅓ oz. |

These figures are based upon 1 gallon, so you would require 75 times the proportions for 75 gallons. In preparing the solution proceed as follows:

Fill your tank about ⅔ full of cold water, and then in a separate receptacle dissolve the necessary amount of sodium cyanide in warm water. When this is dissolved, add the silver cyanide. The amount of sodium cyanide and silver cyanide thus dissolved, should be added to the cold water in the tank, then add the necessary amount of potassium carbonate and the sal ammoniac and stir the solution thoroughly. It is ready for use. As regards your old silver solution, if there is sufficient room left in the tank so that considerable clean, cold water can be added, make such an addition and then add possibly 1 oz. more sodium cyanide per gallon and ⅓ oz. sal ammoniac. These additions should help to put this solution in fairly good condition, although a small amount of silver brightener might be required. To prepare the silver brightener, take a quart of the old silver solution, add to it 1 oz. of bisulphite of carbon and as much sodium cyanide. It will take up by agitation, possibly 4 to 6 ozs. Agitate at intervals for a time, and then decant off the clear solution. Some of the carbon will be found at the bottom. Add of this brightener about 5 drops per gallon of your old solution possibly more can be added. This will act as the brightening factor. C. H. P. Problem 3,220.

## REMOVING ZINC FROM WHITE METAL

Q.—How can I remove zinc from lead-tin alloys?

A.—The proper way to remove zinc impurities, in white metal, is to refine in a furnace similar to the open hearth furnace, which can be operated by oil, gas or coke. Charge all the metal into the furnace after getting the furnace to a white heat and to every 5,000 lb. charge, add as a flux:

| | | |
|---|---|---|
| Sal soda | ..... | 15 lbs. |
| White Sand—high in Silica | ..... | 75 " |
| Fluorspar | ..... | 50 " |
| Hard Coal | ..... | 100 " |
| Lime | ..... | 25 " |
| Iron Scale | ..... | 100 " |

This flux will throw the tin and lead to the bottom and as you skim off the slag, all the impurities come off with the slag. If this work is done properly you will have a very good recovery and a pure lead and tin alloy. W. J. R. Problem 3,221.

## SILVER CHLORIDE FROM SCRAP SILVER

Q.—How can I make silver chloride out of scrap anodes?

A.—Scrap silver anodes can be converted to silver chloride as follows:

For every ounce by weight of pure scrap silver, 4 ozs. of pure nitric acid and 1 oz. water will be required to dissolve it to the nitrate.

Weigh the total amount of silver to be dissolved, then put the necessary amount of acid and water in an earthenware jar. The water should be heated to 120° F. Add the silver in small amounts to the acid as fast as it is dissolved, adding more acid and water if necessary to complete the solution of the silver.

When the operation is completed, add cold water to the acid and silver (twice as much water as acid and silver); now add muriatic acid to the nitrate silver solution with constant stirring until no more silver chloride is preciptated. It s best to let the silver chloride settle to the bottom of the jar, then syphon off the clear solution into another jar. It should be tested with a little more muriatic acid to determine whether any more silver is held in solution.

The silver chloride resulting from the precipitation of the nitrate must be washed first with cold water, then allowed to settle and syphon off the water and throw away. Repeat the washing operations at least 6 times using warm water after the first washing. The silver chloride will then be ready to dissolve in sodium or potassium cyanide. C. H. P. Problem 3222.

## TINNING GREY IRON

Q.—What is the procedure for tinning grey iron?

A.—The successful tinning of gray iron castings requires more attention to the preparatory details of pickling and cleaning previous to tinning than sheet steel or malleable iron.

The following manipulations should be adhered to:

1. Cleanse from sand and scale if permissible by tumbling in a solution of hydrofluoric acid and water: 1 part acid to 20 parts water. The time required for the tumbling operation or pickling in a still solution approximates from 15 minutes to 3 or 4 hours. Sand blasting can be used to replace pickling operations.

2. Following the first pickling operations, the castings should be thoroughly washed in cold and boiling water; to the hot add 1 oz. or more soda ash—58 per cent per gallon of water. The castings should be again tumbled or immersed in a solution consisting of:

| | |
|---|---|
| Water | .....1 gallon |
| Muriatic acid | .....1 pint |
| Sal ammoniac | .....1 lb. |

Following this operation, wash thoroughly in water and immerse in the tinning flux. This should consist of solution of chloride of zinc to which is added from 4 to 5 pounds of gray sal ammoniac. From the flux the castings should go direct to the tinning kettle. It is sometimes necessary to use 3 tinning operations for successful results. This necessitates three tinning kettles. The first is the roughing kettle; temp. 500° F. A little concentrated zinc chloride solution should be used on top of the molten tin and while boiling, add some white sal ammoniac to the boiling chloride of zinc. Care should be taken to keep the flux fluid. If it becomes hard and dry it is of no value. When the flux becomes hard and lumpy, add more chloride of zinc and sal ammoniac. This flux should approximate a depth of half an inch. The second tinning kettle should be maintained at a temp. of 400° F. The molten tin should be covered to a depth of half an inch or more with beef tallow. An addition of 10 per cent palm oil is permissible. The castings should be immersed direct from the roughing kettle to the second tinning kettle. If the casting comes from the second tinning kettle clean and bright, it is not necessary to re-immerse for a third operation. The castings should be cooled in kerosene oil to set the tin, then immersed in cold water. Following these manipulations you should obtain a satisfactory tin coating. It may be necessary to encircle the kerosene oil tank with cold running water to prevent overheating. C. H. P. Problem 3,223.

# PATENTS

## A REVIEW OF CURRENT PATENTS OF INTEREST

1,482,414. February 5, 1924. **Process of Manufacturing Anti-Friction Bearings and Compounds.** Carl Schmidt, Berlin-Tegel, Germany, assignor of two-thirds to Sparlager G.m.b.H., Berlin, Germany, a corporation of Germany, and one-third to Marburg Brothers, Inc., New York, N. Y.

Process of manufacturing an anti-friction bearing composition of a magnesia cement, consisting in mixing magnesium-oxyde (magnesia usta) with wood pulp previously soaked with oil, and chlormagnesialye, the resulting paste being dried to a cement of great sliding ability.

1,483,030. February 5, 1924. **Furnace for Melting Stereo and Similar Metals, and Other Materials.** Herbert W. V. Wilson, Meols, England.

A furnace for melting stereo and other metals or materials, comprising an outer casing, comprising upper and lower separate parts, the upper part including a hinged lid or door and formed to provide a gas discharge flue, the lower part having a discharge channel and a pot supported in the outer casing on a horizontal axis for oscillation, and blades in the pot for mixing the material during the oscillation of the pot.

1,483,327. February 12, 1924. **Alloy Flux for Soldering Aluminum and Process for Forming Same.** William G. Bolus, Rhinelander, Wis.

An alloy flux for soldering aluminum to aluminum or other metals, comprising tin, aluminum, bismuth and silver, substantially in the proportions specified.

1,483,337. February 12, 1924. **Device for Soldering Aluminum.** Marcel Said Corsat, Bachet de Pesay, Carouge, Switzerland.

In combination a blowpipe, a nozzle therefor telescopically engaging said blowpipe, an extension on said nozzle extending substantially in line with said blowpipe, and a right angular portion to said extension in line with the axis of said nozzle.

1,483,507. February 12, 1924. **Refractory Article and Method of Making the Same.** Clarence J. Brockbank, Philadelphia, Pa., assignor to Ross-Tacony Crucible Company, Philadelphia, Pa.

A dense hard refractory graphic article of manufacture having a body bond and a continuous glaze of non-ceramic material and of the same co-efficient of expansion and other physical characteristics.

1,483,722. February 12, 1924. **Art of Making Electrolytic Metal and Apparatus Therefor.** Frederic A. Eustis, Milton, Mass., assignor of one-half to Charles Page Perin, New York, N. Y.

The art of producing electrolytic metal which comprises depositing the metal by electrolysis from an electrolyte upon a continuous, flexible, traveling belt cathode while keeping that part of the electrolyte which surrounds the anode away from the cathode, carrying the deposit out of the solution on the traveling belt cathode, and removing the deposit from the belt cathode.

1,483,748. February 12, 1924. **Grinding Machine.** Francis C. Sanford, Bridgeport, Conn.

A grinding machine comprising a grinding wheel carried in bearings; a work support arranged across and near the periphery of said wheel; a second wheel peripherally opposed to the periphery of the grinding wheel, located on the opposite side of the work support and journaled in a yoke rotatable about an axis passing through the centers of said wheels, radial to the axis of the grinding wheel, and lying in a plane bisecting the peripheral working face of the grinding wheel; and means for rotating said wheels at suitable speeds.

1,484,194. February 19, 1924. **Electrode Suspension Device.** Oscar E. Servis, Chicago, Ill.

The combination with an electrode having a suspension shank, of a suspension device therefor, comprising: a sleeve member having a socket for receiving the electrode shank, means carried by said sleeve member for engaging a shank inserted in said socket to secure the shank to said sleeve member, a hook extending from one end of said sleeve member and adapted to be hooked over and to engage two circumferential portions of a conductor rod, and a spring adjustably secured to the hook portion of said suspension device and adapted to engage with a yielding pressure a third circumferential as specified.

1,484,653. February 26, 1924. **Apparatus for Electrogalvanizing.** Felix Kirschner, Vienna, Austria.

An apparatus for electrogalvanizing, comprising a trough for the electrolyte and through which the articles to be galvanized are adapted to travel, a conduit having its opposite ends connected to the trough adjacent the opposite ends of the latter, and means in said conduit for effecting forced circulation of the electrolyte through the trough in a direction opposite that in which the articles to be galvanized travel.

1,484,690. February 26, 1924. **Material for and Method of Cleaning Metal Surfaces.** Percy H. Walker and J. H. Bower, Washington, D. C.

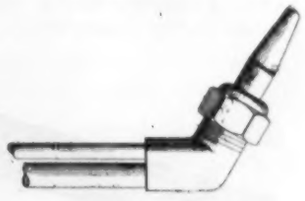
As a new composition of matter useful in cleaning gun barrels and other metal surfaces, a substantially dry mixture comprising ammonium persulphate and ammonium sulphate, in proper proportions to give a suitable metal-cleaning solution upon treatment with water and a fixed alkaline reagent.

1,485,025. February 26, 1924. **Compound for and Method of Treating Metals.** Matthew Green, Detroit, Mich., assignor to Parker Rust-Proof Company, Detroit, Mich.

A compound for treating metals embodying phosphoric acid and a reducing agent, said phosphoric acid being present in a relatively large amount, sufficient to act in conjunction with the reducing agent to remove rust and to, at the same time, rust-proof the metal.

1,485,033. February 26, 1924. **Metal-Working Torch.** Alexander Frederick Jenkins, Baltimore, Md.

In a metal working tool, in combination, a head having on one end a plurality of inclined or beveled seats, one of which surrounds the other, said seats being spaced apart radially of the head and inclined relative to the axis of the head and being so arranged that a plane perpendicular to the axis of the head will intersect said seats or prolongations thereof at different distances from said axis.

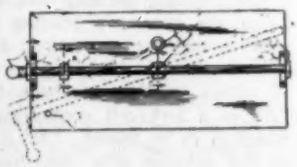


1,485,715. March 4, 1924. **Blowpipe for Metal Soldering.** Frederick Robinson, New York, N. Y.

A blow pipe comprising an air and a gas lead, a gradually tapering outlet pipe and a valve housing connected to the air and gas leads respectively, said outlets having a common inner wall and curved at their ends, the air outlet terminating in a restricted opening and the gas outlet terminating in an enlarged triangular shaped opening disposed slightly beyond the restricted opening.

1,486,622. March 11, 1924. **Clamp for Lead Molds.** Chester M. Angell, Chicago, Ill., assignor to Vesta Battery Corporation, a corporation of Illinois

A mold, a casting swivelled upon said mold, a bar rotatably mounted in said casting, and stops for limiting the motion of the bar about said swivel and for limiting the motion of the bar about its axis.



# EQUIPMENT

## NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

## The Double-Wedge Comparator

### For Determination of the Acidity of Nickel Solutions

Written for The Metal Industry By EUGENE D. STIRLEN, Yale University

The favorable comment of the electro-plating men has recently been turned to the new Double-Wedge Comparator for determination of the acidity of nickel plating solutions. The subject of hydrogen deposition at the cathode is at present receiving a great amount of attention, and much research work is now being done on ways of eliminating this trouble. The deposition of hydrogen goes hand in hand with the acidity of the electro-plating solution, and an exact control of the acidity of the solution is the only way known at present to obtain good sound deposits.

There are several methods which platers in the past have used by which the acidity of the solutions could be estimated in a more or less general way. One method was by watching the deposit of nickel; if the deposit became dark the solution was too alkaline; if hydrogen was liberated the solution was too acid. Another method was by the use of litmus paper. The new apparatus, however, allows a very accurate control of the plating solution, and far surpasses any of the former methods. The solution may be placed at once at the most favorable acidity, and may be kept there constantly, giving uniform and consistent deposition. There is still one further advantage with the new device in that it carries a scale which represents the acidity of the solution by an internationally recognized number, just as a thermometer records the temperature by a recognized number. This puts acidity on an exact basis, and platers may talk of acidity in common terms which mean the same to everyone.

The first outfits were placed in the hands of the electro-platers in December, and were enthusiastically received. Later, after two or three months usage, bubbles began to grow in the prisms causing a great deal of annoyance. The writer, who is the inventor of the apparatus, then took up the problem of eliminating these bubbles, and standardizing the apparatus. After several weeks of experimenting a few minor changes were made, and the new perfected apparatus is now obtainable.

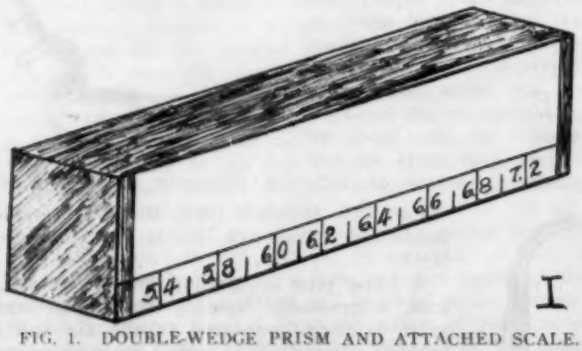



FIG. 1. DOUBLE-WEDGE PRISM AND ATTACHED SCALE.

Although the results obtained by use of the Double-Wedge Comparator are very accurate, its operation is extremely simple, and the non-technical man can obtain results with the outfit which are as exact as those obtained by a skilled chemist. Transparent pyralin has been substituted for glass throughout the entire apparatus, making it practically unbreakable. The essential parts of the comparator are: a double-wedge prism whose color varies markedly from one end to the other; a scale attached to the prism, reading directly the acidity corresponding to any color along the prism; a reading case for holding test cells of the solution under examination; and a bottle of special dye. Figure I shows the double-wedge prism and its attached scale. Figure II shows in diagram form, the method of using the apparatus. "A" is a test cell containing a small quantity of the solution which is to be tested. "B" is a shorter test cell containing some of the solution plus one drop of the special dye. "C" is the double-wedge prism. The operator holds the device toward a source of light, and observes through the two slits "L" and "M," the color of the two beams of light, "X" and "Y." The prism "C" is moved to the right or left until the two beams of light have the same color. When this position is attained the acidity can be read off the scale at slot "N." By means of the two over-lapping cells, "A" and "B," the color effect of the green

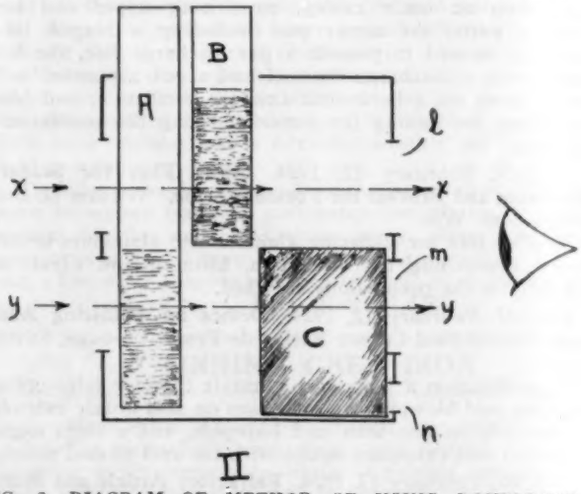



FIG. 2. DIAGRAM OF METHOD OF USING DOUBLE-WEDGE COMPARATOR.

nickel solution is entirely eliminated. The time required in making a test is less than a minute.

The apparatus can be obtained from the Stirlen & Wallace Company, 124 Prospect street, New Haven, Connecticut.

## GOOSENECK WELDING TORCH

The Bastian Blessing Company, 246 E. Ontario street, Chicago, has developed a new series of torches of gooseneck construction. The following advantages are claimed.

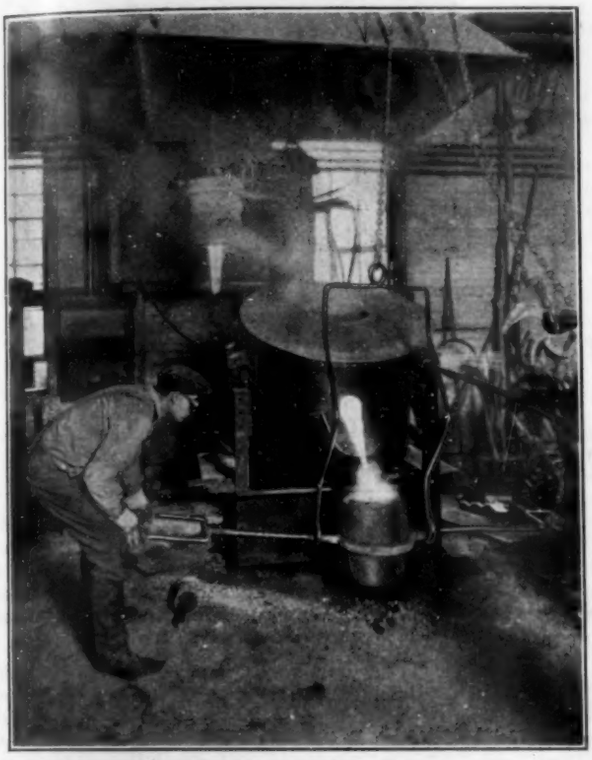
1. A construction guaranteed against flashback.
2. Elimination of the objectionable and sometimes dangerous feature of mixing in the handle.
3. Elimination of the necessity of constant change of mixing chambers.
4. Wide range of tips that are easily interchanged.
5. Substantial in all of its details.
6. Nickel copper heat-resisting tips (not copper coated brass).
7. Taper drilled tips that develop long perfectly neutral cones.

REGO MODEL GL GOOSENECK WELDING TORCH

The Model GL Torch has an assortment of 3 handles and 10 tips, and will, it is said, handle any welding from the heaviest preheated job down to light sheet metal work.

## MODIFIED MONEL METAL

"M-M-M" or Modified Monel Metal was developed by Manning, Maxwell & Moore, for use in their own products, the particular outlets being Consolidated safety valves and Hancock globe and gate valves. The company states that its use in these products has been so successful that it is now offered to the general trade for similar purposes. The medium through which the metal is marketed is the Ashcroft Manufacturing Company, Sales Department, at 100 E. 42nd street, New York.

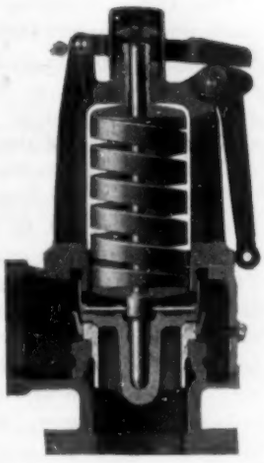


POURING MODIFIED MONEL METAL

M-M-M is a casting metal, designed primarily to stand extremely high temperatures and pressures; its high nickel content places it in the proper class for such work. It is said to be resistant to the erosive action of high pressure steam, non-corrosive to hot alloys and most chemicals like sea water, sulphuric acid and die baths, and it is also said to have unusual physical properties at high temperatures such as the retention of over 50,000 pounds per square inch tensile strength at 600° F. to 900° F.

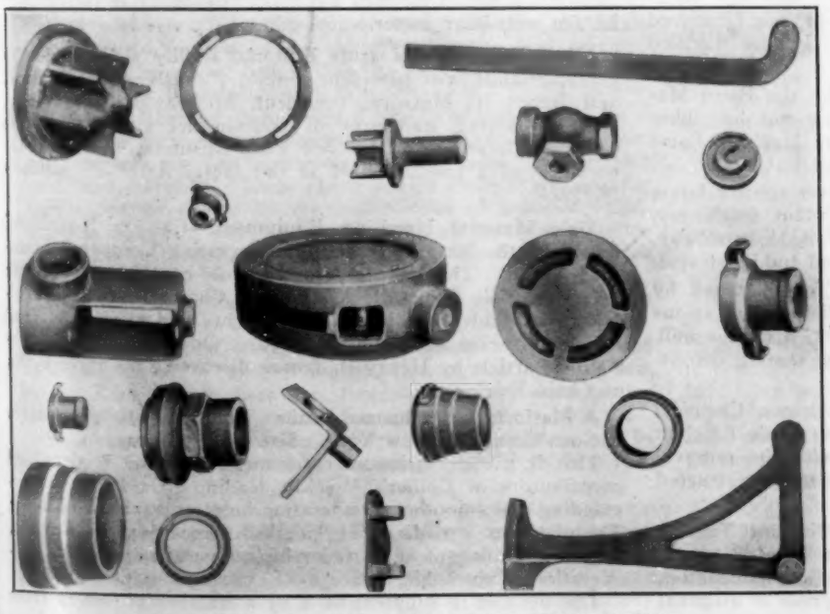
The metal, it is claimed, runs freely into thin sections giving short edges and smooth surfaces. Small castings with delicate extensions can be made and heavy castings having complex course are said to give no difficulties.

The metal cannot be annealed, which accounts for its unusual high temperature properties. It is stated, however, that it can be machined without difficulty, using the proper tools and methods of workmanship. The tool should be of the high speed type, such as carbon .7 per cent, tungsten 17 per cent, chronium 3 per cent, vanadium .8 per cent, silicon .3 per cent, sulphur .02 per cent, phosphorus .035 per cent, manganese .2 per cent. The tools should have a keen edge with a decided rake.



CONSOLIDATED SAFETY VALVE WITH M-M-M PARTS

It is recommended that multiple thread chasers, if employed in thread cutting dies may be used if the work is not too large. For finishing holes, high speed reamers are used to best advantage, allowing only three to five hundredths of an inch to be cut, according to the size of the hole.



VARIOUS PARTS CAST OF MODIFIED MONEL METAL

## NEW ALUMINUM ALLOY

Otto Timeus, Inglewood, Cal., has two patented processes to manufacture aluminum. By the first process (aluminum cast in sand) the metal is said to have a tensile strength of from 14.6 kg./mm. (20,765.73 lbs. per sq. in.) to 35.1 kg./mm. (49,923.08 lbs. per sq. in.); elongation, 1.5% to .5% in about 2 inches. Other characteristics claimed are as follows:

It is hard.
It has great heat resistance.
It machines beautifully; chips curl like steel.
It can be recast without the loss of tensile strength.
It does not sag.
It is uniform; in over a hundred tests made no flow was found.
It is a light metal; the specific gravity is very slightly above pure aluminum.
It rings and has a uniform very fine grain like tool steel.

Its yield point is high. Example: Ult. 43,295 lbs. per sq. in. Yield point, 36,015 lbs. per sq. in. (Fully 80%.)

It does not contain magnesium, therefore the drawbacks arising from the use of magnesium or inherent in magnesium are entirely eliminated. No storing or curing is required, hence it can be used or worked at any time.

By the second process, aluminum sheet, bars, etc., have a tensile strength from 40 kg./mm. (56,892.40 lbs. per sq. in..) to 70 kg./mm. (99,561.70 lbs. per sq. in); elongation, 0% to 7% in 2 inches. Other characteristics claimed are as follows:

All that is stated of the cast aluminum is equally true of the sheet aluminum. In addition:

It can be rolled, forged, pressed, drawn.
It can be bent 180% when necessary.

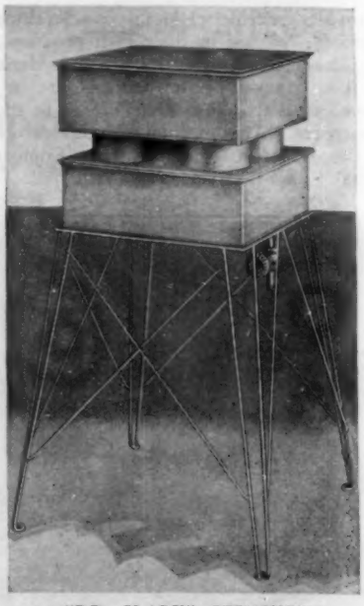
The lesser strengths are given in the patents; from thence it can be increased at will.

## PAINT AND ENAMEL STRAINER

The Purity Stamping Company, Battle Creek, Mich., is marketing a strainer caller the "Dr. Clark" strainer or filter for filtering paint, enamel and varnish, particularly for materials to be applied to the work with a spray brush. The appliance is said to be particularly useful since it insures against sediment and the resulting specks which cause rough surfaces on the finished work.

The strainer is composed of four units. Each unit has a cotton disc clamped to the bottom and it is through this cotton disc that the enamel, paint or varnish must filter. Then there is an auxiliary strainer of four units which will catch anything that gets through the first strainer. The liquid, after running through these two strainers, goes into a storage tank where it is kept until desired for use. The strainer tank will care for seven or eight gallons, which is ample for the ordinary manufacturer. When it is desired to use some of the liquid, all that is necessary is to place a receptacle under the discharge valve and draw off the amount needed.

The "Dr. Clark" strainer is simple, made entirely of metal and, it is claimed, meets the approval of the insurance underwriters. The manufacturers guarantee that enamel, paint and varnish can be filtered at a cost of not more than one-half cent per gallon.



"DR. CLARK" STRAINER

## EQUIPMENT AND SUPPLY CATALOGS

**Sand-Blast Equipment.**—A folder issued by Pangborn Corporation, Hagerstown, Md., on its numerous lines of new machines for sand blasting.

**Trufelt.**—A circular issued by Canadian Hanson & Van Winkle Company, Ltd., Toronto, Canada, on its pure wool polishing and buffing wheels.

**Exposition of the Golden Jewelers.**—A booklet issued by John O. Golden, 432 Worcester Building, Portland, Ore., describing the Golden jewelers practical electroplating outfit.

**"Hot Dip Galvanizing."**—A booklet issued by the Bessemer Galvanizing Works, Birmingham, Ala., discussing the hot dip galvanizing process chemically, economically and historically.

**Brazing Solder.**—A folder issued by the Waterbury Brass Goods Corporation, Waterbury, Conn., covering Holtite Spelter Solder for brazing purposes, including a descriptive table.

**Water Still.**—A booklet issued by Weber Brothers Metal Works, 108 N. Jefferson street, Chicago, Ill., on their Improved "Rochlitz" Automatic Water Still for making pure distilled water.

**"Baird Machinery."**—A pamphlet issued by the Baird Machine Company, Bridgeport, Conn., illustrating and describing the Baird Four Slide Machine, Baird Chucking Machine, Baird Chain Making Machine, and Baird Tool and Die Grinder.

**Power Plant Lubrication.**—A treatise covering the latest developments in the lubrication of power plant machinery, issued by the Tide Water Oil Sales Corporation, 11 Broadway, New York City. The book is attractively bound and illustrated.

**"A Diversity of Interesting Things."**—A folder issued by the Hoyt Metal Company, St. Louis, Mo., listing its various products for rolling mill and pipe departments, Britannia mill, mixed metal department, bronze back and die casting departments.

**Pickling.**—Bulletin No. 15, issued by American Chemical Paint Company, Ambler, Pa., entitled Pickling Made Efficient with Rodine Extract. This booklet deals with the removal of scale and rust from raw and finished products constructed of iron and steel.

**Diamant Dies.**—A folder issued by the Diamant Tool & Manufacturing Company, Inc., 91-97 Runyon street, Newark, N. J., illustrating and describing its standard 4-component set, which comprises punch holder, blank die shoe, rear or diagonal liner pins and bushings.

**Cleveland Electric Tramrail.**—Catalog No. 2, issued by the Cleveland Crane & Engineering Company, Wickliffe, Ohio, illustrating and describing Cleveland Electric Tramrail System for brass foundries, warehouses, rubber plants, coal handling, garages, painting departments, etc. This catalog is elaborate and interesting.

**Mono-Line.**—A folder issued by Quigley Furnace Specialties Company, 26 Cortlandt Street, New York City, giving directions for using Mono-Line, a ready-to-use ganister for lining and patching cupolas, ladles, pit and tilting furnaces, converters, etc. Also a letter of recommendation from the Tottenville Copper Company, Tottenville, S. I., N. Y.

The **General Electric Company** has developed a distant dial mechanism for use with watt-hour meters where, for various reasons, it is desired to have the registration of the meter appear at a point remote from that where it is installed. This device is actuated through a contact mechanism in the register of the watt-hour meter.

**"How Publishers Measure Editorial Ability"**—A booklet by C. G. Phillips, vice-president United Publishers Corporation, and James H. McGraw, president, McGraw-Hill Company, Inc., containing transcript of address delivered before the editorial conference of the New York Business Publishers Association at a meeting held at the Hotel Astor on January 18, 1924.

**Yale Material Handling Equipment.**—Catalog No. 21-M, issued by the Yale & Towne Manufacturing Company, Stamford, Conn. This is a reference book containing complete details of Yale Chain Blocks, Electric Chain Hoists and Trolleys, with tables of dimensions, weights and clearances; and lifting, lowering and running speeds. One of the features is a signed article by Henry R. Towne discussing the three types of Chain Docks.

**A Platform for Industrial Peace.** Published by P. F. Collier & Sons Company, New York. Size 6 x 8—46 pages.

This is a compilation of recommendations by readers and contributors of Collier's Weekly, leading to a better understanding and smoother co-operation between capital and labor. The platform is made up of "planks" named Service, Reward, Capital, Management, Leadership, Operation, Work, Co-operation, Knowledge, Peace.

The booklet is supplemented by a number of letters from readers expressing their opinions about this platform.

# ASSOCIATIONS and SOCIETIES

**REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS**

## AMERICAN FOUNDRYMEN'S ASSOCIATION

**Headquarters, 140 South Dearborn Street, Chicago, Ill.**

### CONVENTION PROGRESS

Applications for space for the 1924 Exhibit are coming in daily and the management wishes to remind those interested that April 7th was the time limit set for filing applications by former exhibitors.

The price of space will be computed on the same basis as last year, ranging from 70 to 80 cents per square foot with 10 to 20 per cent extra for preferred corner locations.

From the applications already received, it seems quite probable that every available foot of space will be required that can be provided. It is hoped that each applicant will receive a detailed layout of all exhibit space with complete information, about the middle of May, at which time a form will be submitted for nominating locations.

## AMERICAN ELECTROCHEMICAL SOCIETY

**Headquarters, Columbia University, New York**

### SPRING MEETING

The spring meeting of the American Electrochemical Society in Philadelphia, April 24, 25 and 26 promises to be one of absorbing interest to electrochemists. It would be difficult to select a more suitable city for a place of meeting than Philadelphia. Located amid beautiful surroundings and adjacent to enormous industrial establishments, it offers many features of personal appeal and interest, in addition to many interesting excursion trips.

One symposium covers "Recent Progress in Electro-Deposition." Mr. S. Skowronski, Research Chemist of the Raritan Copper Co., is chairman. A series of very interesting papers have been planned for, covering "Electro-Refining of Metals," "Electro-Reduction of Metals," "Electro-Forming of Metals" and "Electro-Plating of Metals."

A large number of papers have been promised for the Electro-Deposition Symposium. There have been very many important changes taking place within the last ten years in electrolytic refining of metals and electrolytic winning of metals from bleaching solutions and we hope that at the Philadelphia meeting many of the innovations will be brought up for discussion, and a large attendance is expected at the symposium.

Within the last few years, the electrolytic refining of tin has gone through very important stages. Originally, the electrolyte was modeled after that of the electrolyte used in lead refining; namely, the fluosilicate bath. This has now been dispensed with and the simple tin sulphate bath is used.

Large quantities of cadmium are now produced cheaply as a by-product of the electro-refining processes, particularly that for zinc, and cadmium has become an important metal for protecting steel from corrosion. Three plants in this country are devoting their entire energies to the electro-deposition of cadmium. Cadmium is also used now, to some extent, as an addition to the silver bath in producing a silver deposit which does not tarnish and is not affected by hydrogen sulphite.

Improvements in the electrolytic nickel process have also been made.

Another attraction of the technical program will be a Round Table discussion on "Electro Furnace Refractories." In addition, to the Round Table discussion, there will be several interesting papers presented dealing with various phases of the subject.

In addition, two interesting lectures will be delivered, one by Dr. D. J. Barnett, at Franklin Institute, the other by Mr. John Mills.

To those interested in excursion trips to industrial plants and places of interest—Philadelphia offers a large number of attractions. Trips have already been arranged to visit the Philadelphia Mint, Disston Company, Dodge Steel Casting Co., Ajax Wyatt Co., Westinghouse Electric & Mfg. Co., and an airplane factory. Arrangements have also been made which will afford a splendid opportunity to society members to visit Edgewood Arsenal, on Saturday, April 26. The arsenal consists of eight main divisions; administrative, chemical, mechanical, medical, research, troops, plants and production, property and chemical warfare school. Its operation on a peace time basis, as well as the facilities that are available for war emergencies, should be of interest to all of our members.

Dr. Arthur E. Gibbs, of the Pennsylvania Salt Mfg. Co., is chairman of the local entertainment committee. One of the several entertainment features will be a boat ride and Shad dinner.

## WASTE MATERIAL DEALERS

**Headquarters, Times Square Building, New York**

### ANNUAL MEETING OF THE ASSOCIATION

The Eleventh Annual Meeting of the National Association of Waste Material Dealers, Inc., was held at the Hotel Astor, New York, on Wednesday, March 19, the meeting being called to order by President De Groat at 10:30 A. M. The attendance was larger than for many years, practically all sections of the country being represented. The treasurer's report, as rendered at the meeting, indicated that the organization was in a strong position financially, while the secretary's report showed that there had been elected to membership, since February 1, 1923, 147 new members, representing that number of individual firms or corporations. Additional applications were received at the meeting and it is fully expected that the membership will pass the 400 mark in the very near future, probably long before the next meeting, in June.

President De Groat, in reporting for the past year, emphasized the fact that the association was forging ahead, and he asked for the co-operation of members in making the organization even bigger and better than it is at the present time, and particularly emphasized the importance of members doing their share in obtaining new members.

The next matter of business was the election of officers, and after the report of the Nominating Committee had been submitted, it was voted that the secretary cast one vote for the officers and directors as submitted by the Nominating Committee, which was done. The ticket, as nominated and elected, was as follows:

For President—Harry R. De Groat.

For Directors for Two Years—Louis Birkenstein, James Rosenberg, Henry Lissberger, Ivan Reitler, John A. Murphy, Clarence B. White, H. H. Cummings, George B. Smitheman, Herman Muehlstein, G. H. Rady, Alex Luria, Robert Johnston, Jr.; S. C. Weber, Edward Seitzinger, Henry Levitt.

For Directors for One Year—E. H. Silberman, C. L. Hils, D. A. Singer.

Following the annual meeting of the association, there was held the anual meeting of the Board of Directors, at which meeting the following officers were elected:

First Vice-President—Edmont Frankel.

Second Vice-President—Henry Lissberger.

Third Vice-President—G. H. Rady.

Treasurer—Charles M. Haskins.

### MEETING OF METAL DIVISION

A very well-attended meeting of the Metal Division was held at the Hotel Astor, New York, on Tuesday afternoon, March 18. Many of the members present were particularly interested to hear Norbert Levy, of Berlin, outline the situation in Germany. Mr. Levy pointed out that Germany needed large tonnages of metal from America, particularly such grades as clippings, turnings, old light copper, cartridges and rifle shells. He expressed the hope that more members of the association would visit Germany and pledged the co-operation of the German associations towards the working out of problems of mutual interest. Mr. Levy, who was one of the first in Germany to become a member of the National Association of Waste Material Dealers, was given a rising vote of thanks by those present, who were much interested in his remarks. Egmont Frankel, of Frankel Bros., Toronto, was re-elected chairman of the metal division.

## AMERICAN ELECTRO PLATERS' SOCIETY

### BRIDGEPORT BRANCH

**Headquarters, Care of R. J. O'Connor, P. O. Box 671**

The Bridgeport Branch has a new laboratory and meeting room at room 17, 62 Cannon street. The branch is working with various manufacturers and trying to interest them in the society. From the attendance at the meeting held at the Bridgeport Brass Company on March 7, it appears that almost all the local manufacturers are interested. W. R. Webster complimented the local branch on its activity.

## METAL FINISHERS' EXPOSITION

It is announced by the Executive Committee that the Metal Finishers' Exposition, which was to be held in Dayton, Ohio, April 14-19, 1924, has been postponed until May 12-17, 1924. The specific reason for the postponement is to give local manufacturers a better opportunity to make the necessary preparations, as many of them have already taken part in several events recently. Moreover, the advanced date will afford the Committee more time to carry out the enlarged plans for this year's event.

## BRASS MANUFACTURERS

**Headquarters, City Hall Square Building, Chicago, Ill.**

The National Association of Brass Manufacturers' held a very interesting and well attended meeting at West Baden Springs Hotel, West Baden, Indiana. After a three days' session, the meeting came to a close on Friday night, March 14.

The American Sanitary Manufacturing Company, Abingdon, Illinois, and the Vulcan Brass Manufacturing Company of Cleveland, Ohio, were elected to membership.

STANDARDIZATION

The question of standardizing traps, of which the Department of Commerce, Division of Simplified Practice, at Washington, D. C., through active co-operation with the trap manufacturers of various kinds, both cast and wrought, have recommended a reduction of trap combinations to 117. This matter was discussed and referred to a special committee to co-operate with interested manufacturers and the Department of Commerce.

Recommended to work towards the use of No. 27 thread as standard for all tubing thread. It is not the intention that this should be put in use at once, but the manufacturers should keep this in mind when such changes are brought about that they can adopt this standard.

VARIANCE IN THREADS

Through the Standardization Committee report was tendered that there is a variance in threads, as well as construction of both brass and iron fittings, and the commissioner was instructed to take up with the manufacturers and seek their co-operation in conforming in the Briggs' Standard Gauge, and to exercise every care possible in the matter of tapping these fittings, with a view of expediting matters and eliminating additional cost to the contractor and the public.

TRADE EXTENSION BUREAU

Through a report from Director Lawnin of the Trade Extension Bureau, outlined the splendid work being done by that department, and in commending it to all members pointed out the advantage of assisting the bureau, financially as well as morally.

U. S. CHAMBER OF COMMERCE

Councillor Eckhouse in tendering his report advised the members that May 6 to 8 in the City of Cleveland, the Chamber of Commerce would hold its annual meeting, and urged all who could possibly attend to do so.

The financial condition of the treasury was reported in good condition, along with a number of bonds which the association holds as a reserve fund.

The next meeting of this association will be held on Wednesday and Thursday, June 11 and 12, at Mt. Clemons, Michigan.

# Personals

## GEORGE K. ELLIOTT

George K. Elliott of Cincinnati, Ohio, the newly elected chairman of the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers is a native of his residence state and received his higher education at the University of Cincinnati. After graduating he spent one year teaching chemistry and physics at the Cincinnati Technical School, since incorporated with the University.

GEORGE K. ELLIOTT

While engaged in teaching he received an offer to take charge of the chemical and physical laboratories of The Lunkenheimer Company which had been but recently installed; it was through the work performed in this department that he developed into chief metallurgist of that company. In this position which he has filled for many years he has been placed in active intimate contact with metallurgical developments especially in the fields of the founding of non-ferrous metals and alloys, of iron, and of steel. His company was one of the early users of electric furnaces for melting steel and through his researches there was developed in the Lunkenheimer iron foundry the well-known duplexing process for gray iron in which cupola-melted iron is refined in an electric furnace. In 1921 he was invited to write the first exchange paper for the American Foundrymen's Association to be presented to the Institution of British Foundrymen.

In the field of non-ferrous metallurgy Mr. Elliott has been much concerned with the production of non-porous alloys suitable for high pressures as well as being capable of withstanding the elevated temperatures which have become so prominent in modern power plant developments. In addition to being chairman of the Institute of Metals Division, Mr. Elliott also is a vice-president of the American Electro-chemical Society, being chairman of its Electrothermic Division; also he is active in the American Foundrymen's Association, the American Chemical Society, the Society of Chemical Industry and the American Society for Testing Materials in which he belongs to the committees on non-ferrous metals, cast iron and steel. For several years he also has been on the advisory committee on non-ferrous metals and alloys for the U. S. Bureau of Standards.

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**J. Donald Cottrell,** has become connected with the New Jersey Zinc Company, at Palmerton, Pa., as a research helper. Mr. Cottrell was formerly a sulphuric acid plant operator for the Pennsylvania Trojan Powder Company.

**T. R. Harrison** has assumed charge of the research department of the Brown Instrument Company, Philadelphia, Pa. Mr. Harrison was formerly associated with the pyrometry department of the Bureau of Standards, and more recently with Champion Porcelain Company of Detroit.

**Charles W. Tubby** has resigned as district manager in charge of sales and engineering for the Worthington Pump & Machinery Corporation at the St. Paul office, and for the last four years at the Seattle office. Mr. Tubby is again active in similar work in Seattle.

**Alexander Harper** has been elected president of the Bristol

Brass Company, Bristol, Conn., succeeding **A. F. Rockwell.** Mr. Harper is also president and general manager of the American Silver Company of that city.

**Alfred W. Force** has resigned from the employ of J. H. Gautier & Company, Jersey City, N. J.

**F. H. Becker** has been transferred to the Linde Air Products Company, where he will be engaged in sales development work. He was formerly Eastern sales manager of Haynes Stellite Company, New York City.

**A. F. Saunders** recently lectured before the Ka-Na-Te-Nah Club, in Syracuse, N. Y., on the Evolution of the Spoon. He traced the spoon from the bone, shell and ivory ladles used in Egypt as early as 2,000 B. C. to the graceful silver spoon of to-day.

**G. P. Rogers** will become vice-president and director of sales and advertising for the Kant Rust Products Corporation, Rahway, N. J., having resigned his position as general sales and advertising manager for the Pyrene Manufacturing Company, Newark, N. J.

**John D. Bird** has been elected president of the American National Bank of Milwaukee. Mr. Bird is general manager of the Worthington Pump & Machinery Corporation, Cudahy, a suburb of Milwaukee, Wis. He is also president of the Cudahy State Bank.

**Robert E. Mooney,** for several years connected with the A. C. Gilbert Company, New Haven, Conn., as foreman plater, has resigned to accept a position with the Anderson Chemical Company, 30 Church street, New York, manufacturers of lacquers, lacquer enamels and solvents. Mr. Mooney will cover the State of Connecticut.

**Norman B. Pilling** is now associated with the International Nickel Company, as metallurgist in its department of development and research at Bayonne, N. J. Mr. Pilling was formerly metallurgist in the research department of the Westinghouse Electric & Manufacturing Company, E. Pittsburgh, Pa., having been with that concern since 1917.

**Lewis H. Dietz** of the Walworth Manufacturing Company, Boston, Mass., has been transferred to the Philadelphia branch, as sales engineer in charge of sales of the company's engineering specialties. Mr. Dietz has been with this company for seven years, and has served successively as shop employee, assistant production manager Boston works, assistant engineer of product and statistician before entering upon this work.

The **Parker-Rust Proof Company** has installed a Udylite plant and is taking over the Michigan rights on that process. **T. C. Eichstaedt** is in charge of this jobbing plant in Detroit, which is also a demonstrating plant for that process. The plant has not as yet been installed except for rough work. The Udylite process will be used for finishing work and nickel plating over it. Job work will be taken in, guaranteeing a rust-proof nickel plating on all steel and iron work.

**J. V. Martin,** who for the past twenty-five years has been connected with the Monarch Engineering & Manufacturing Company of Baltimore, Md., in the capacity of representative and salesman, has completed a trip to the Pacific Coast in which he visited the brass foundries of the principal cities. After being in California for several months, Mr. Martin returned and went through New England. He reports that business is fair in all of the localities in which he traveled.

**John C. Oberender,** formerly with the Celluloid Zapon Company, Park-Lexington Building, New York, as sales manager of the New England District is now with Maas & Waldstein Company, 45 John street, New York, as assistant to H. C. Flanigan. Mr. Oberender spent seven years with P. & F. Corbin as foreman of the lacquering and plating departments, and six years with Eberhard Faber Pencil Company as foreman of its finishing department. He is, therefore, well qualified for his new work with the Maas & Waldstein Company.

A new and original method for the reduction of refractory ores has recently been developed, after several years of research, by **Simon J. Lubowsky,** research engineer of the Metal & Thermit Corporation, which it is claimed will be of great practical interest to the metallurgical industry. The principle of this new method of isolation is applicable on a commercial scale to many of the Rare Elements, although Mr. Lubowsky has carried his work to completion only with respect to metallic Titanium. This metal, which has heretofore been obtainable only as a laboratory curiosity, is now to be had in larger quantities.

# Deaths

## WALLACE HETHERINGTON LINN

Wallace Hetherington Linn, whose death was noted in the March issue of THE METAL INDUSTRY, was born in Jersey City, December 6, 1888, and attended public school, later on going to the Morristown School at Morristown, N. J. After his school days, he was for a short while in one of the large banks in New York, but in 1907 entered the employ of E. A. Williams & Son, Jersey City, N. J., as assistant shipping clerk and from this position he worked up through the various departments until he was at the time of his death treasurer and one of the directors.

WALLACE HETHERINGTON LINN

When this country entered the World War Mr. Linn immediately volunteered and his wish for overseas service was granted. He was assigned to the American Ordnance Base Depot in France. This appointment was due entirely to his qualifications as an expert on non-ferrous metals, and at that time it was expected that he would occupy the position of Chief of the Foundry and Forge Department in the American Expeditionary Forces; in fact he took with him to France an entire ordnance company recruited from the various foundries in and about Jersey City. However, in the general unsettled conditions on the American front he was detached from this ordnance duty and made a Captain of Military Police in the combat zone, later being attached to the French Army in their Bureau of Secret Research, reporting direct to the French Minister of War.

In the preformance of his duties in the Bureau of Secret Research he contracted the illness that was ultimately the cause of his death. Many know of the soldierly battle that he put up against the inevitable and how at times during the past few years it almost seemed as though he had won out, though at no time was he entirely free from medical care. During the last seven months his illness became steadily more acute and as a last resort a most delicate operation was performed but even this did not save his life.

His company feels that with the death of Mr. Linn they have lost more than a co-worker and member of their force; for his many manifold virtues made all who came in contact with him esteem him as a friend. They take comfort, however, in feeling that the influence of his life cannot fail to remain, and that those who have been left will be the better men and women for having known him.

## CHARLES J. VOGT

Charles J. Vogt died on February 22 at his home, 85 Woodward avenue, Buffalo, N. Y. Mr. Vogt was for the last 20 years president of the Buffalo Galvanizing & Tinning Works.

## LUTHER J. TURNER

Luther G. Turner, honored and beloved resident of Torrington, for 48 years associated actively with the Turner & Seymour Manufacturing Company, of which he was for many years president and general manager, died March 27 at Southern Pines, N. C., where he had stopped for a brief stay while en route to his home after a Winter's sojourn in Florida. Death was due to pneumonia.

Mr. Turner was 78 years of age, a native of New London. He attended the New London public schools and Madison University and came to Torrington in 1867 to enter the employ of Turner & Company, of which his uncle, Elisha Turner, was the founder. Three years later he became New York representative of the Turner & Seymour company. In 1876 he was made secretary and in 1879 a director of the company. He continued as manager of the New York office, however, until 1892, when he returned to the home office to assume the duties of treasurer and manager. Subsequently he was elected president and held that office until 1915, when he retired to enjoy a well-earned rest from the cares of business. He resumed the burden once more in April, 1922, and remained until negotiations had been successfully carried out for the transfer of the business to a group of prominent Torrington and Stamford men.

Mr. Turner was a man of exceptional mechanical skill and ingenuity and during his long period with the Turner & Seymour company he perfected and patented a number of valuable mechanical devices.

Besides being an executive of the Turner & Seymour company he was a director of the Torrington Manufacturing Company and of other foremost industrial and banking institutions of Torrington.

Generous in his support of worthy causes, actively identified with every movement for the betterment of the community and blessed with a pleasant, kindly disposition, he was universally loved and esteemed by his fellow townspeople. He was for many years a vestryman of Trinity church, a former president and trustee of the Y. M. C. A., an incorporator of the Charlotte Hungerford hospital, a member of the board of managers of the Maria Seymour Brooker memorial and helpfully associated with other organizations. He was a member of the Masonic order, and various clubs in Connecticut and New York; and was recognized as an authority on questions dealing with the history of the Naugatuck valley and its industries. His wife, one son, Mason, who is in the consular service in Ceylon; and two daughters, Miss Marjorie S. Turner and Mrs. Wadsworth Doster, survive. The funeral was held Monday, March 31, from his late home on Migeon avenue, Torrington, with burial in Hillside cemetery.

## JOHN F. ALVORD

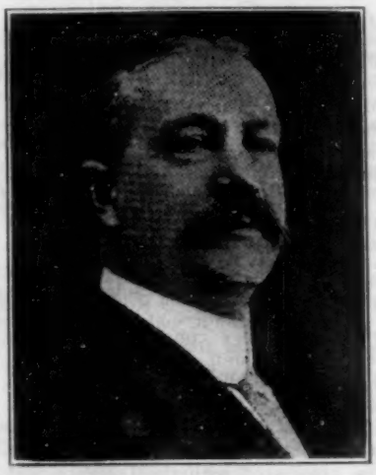
John F. Alvord, president and chairman of the Board of Directors of The Torrington Company, one of the largest needle making concerns in the world, and affiliated with many other manufacturing enterprises, died suddenly March 13, 1924, in his home, No. 34 East Fortieth Street, Torrington, Conn. Death was due to a stroke of apoplexy.

Mr. Alvord, who was a bachelor, was born in Torrington, Conn., May 9, 1861, the son of Charles Alvord, founder of the Excelsior Needle Company, which later became The Torrington Company. After finishing his education in the public schools he joined his father in the manufacture of needles, and much of the success of the business in recent years was due to his efforts.

Besides being president of The Torrington Company, he was also president of The Progressive Manufacturing Company, also of Torrington, Conn.; the Splitdorf Electrical Company, of New Jersey, and was a director and one of the founders of Torrington National Bank; a director of The Wire Wheel Corporation of America, the Union Hardware Company and a number of others.

## A. GARDINER COOPER

A. Gardiner Cooper, died suddenly Saturday morning, March 8, at his winter residence, Fort Lauderdale, Fla., from a sudden and acute seizure of the heart. He was senior member of the old established metal firm of Bruce & Cook, New York City. In 1880 Mr. Cooper entered the employ of Bruce & Cook in a clerical capacity, and rose higher and higher in the councils of the firm, until in 1902, he was made a partner.



A. GARDINER COOPER

Mr. Cooper was interested in many philanthropies, and was a man of deep thought and unobtrusive religious convictions. He was born in Sag Harbor, L. I., 61 years ago, and had an inherent love of the sea. He spent a greater part of his leisure moments in yachting and fishing, having formerly been Commodore of the Indian Harbor Yacht Club, and also a member of the Shelter Island and Sag Harbor Yacht Clubs, as well as the Hardware Club of New York.

Mr. Cooper was a sturdy and outstanding figure in the metal trade of the country, and enjoyed the unqualified respect and esteem of the industry at large. He was so thoroughly democratic in his conduct and ways that the lowliest ones in the employ of the firm never hesitated a moment in bringing their troubles to him, sure of a sympathetic hearing and a sound disinterested advice. He is survived by his widow, Mrs. Nellie Cooper, three daughters, a brother and two sisters.

## FRANK K. CHEW

Frank K. Chew passed away at Morristown, N. J., March 8, in his sixty-seventh year. He was a business paper journalist well known in the sheet metal, stove, plumbing and heating fields.

Since March, 1893, he had been continuously identified with the Metal Worker, until some six years ago a sister publication of The Iron Age, and since then conducted as the Sheet Metal Worker by the Edwin A. Scott Publishing Company, New York. Mr. Chew was a prodigious worker for the uplift of the trades his paper represented, and took prominent part in the affairs of the employing artisans of those trades, especially in the trade associations and allied engineering bodies.

## EDWARD J. MONAHAN

Edward J. Monahan was found dead at his summer cottage at Silver Sands, East Haven, Conn., February 20th. He was general superintendent of the New Haven Clock Company, New Haven, Conn.

## WILLIAM KEATING

William Keating died at his home in Toronto, following a long illness. He was founder and president of the Keating Brass Manufacturing Company.

# NEWS OF THE INDUSTRY

**BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS**

## NEW ENGLAND STATES

### WATERBURY, CONN.

April 1, 1924.

Passing of the **Anaconda** dividend, while not wholly unexpected, was somewhat of a disappointment to former **American Brass Company** stockholders here. What effect the recent acquirement of the American Brass Company by Anaconda had on the latter's earnings has been the chief subject of comment. It is felt that the Anaconda company's earnings cannot help but have been increased since the merger because the local concern has always shown high earnings. This is proven by the fact that not long after the merger, Anaconda for the first time in many months paid a dividend, and continued to do so until this last quarter.

The general impression among local stockholders is that the company's heavy interest charges, $9,000,000 a year due to its going into debt so much to purchase the American Brass and **Chili Copper** are responsible for the passing of the dividend. The general summing up is that of a Philadelphia financial expert, "the purchase of the American Brass Company helped the parent company somewhat but not enough." Local officers of the American Brass Company declined to comment on the passing of the dividend or on the explanations given by financial experts, except to say with regard to the statement just quoted, "there is no question but that the purchase helped the Anaconda company 'some,' but how much it helped no one except the high officers of the Anaconda company are in a position to say."

The plant of the **Eastern Brass & Ingot Company**, well known local "war baby," was sold at auction last month, after lying idle most of the time since the war. The purchasers are Attys. Herman J. Weisman and Marcus A. Weisman of this city, who expect to resell the plant. The price paid for the building, machinery and land is $58,000, the purchasers receiving title to the land free and clear of all incumbrances. The Central Trust Company of Illinois has a first mortgage of $100,000 on the place and there are other creditors. The sale must yet be approved by Judge Thomas of the U. S. District Court who will decide whether the whole of the $58,000 or only part shall go to the Central Trust Company.

The **Chase Companies, Inc.**, have purchased six acres of land in the Fairmount section, Waterville, from **George Baronian**, which they intend developing for home sites for their employees. A 50-foot boulevard will be put through making a short cut from Waterville to Oakville, the intention of the company being to spend several thousand developing the section.

Copper has been found present in the Housatonic river, according to the National Bureau of Fisheries, which declares the present of this substance is deadly to oyster larvae. Zinc is also found but this is less harmful, states the Bureau.

The state Chamber of Commerce has again taken up its study of the pollution of streams with a view to drafting a bill for introduction into the next legislature. The bill, last session, was killed largely because of the opposition of the manufacturers along the Naugatuck Valley, who held it to be discriminatory, inasmuch as it would prevent their emptying mineral wastes into the river but would allow the cities to empty their sewage into the river. The fight is distinctly between the oyster growers and the manufacturers, the latter holding that their industry is more important to the life of the state and that the oyster growers, if allowed to have their will, would absolutely put the brass factories out of existence. The state Chamber will hold hearings on the proposed bill when it is drafted.

City Plumbing Inspector James Walker at a recent Chamber of Commerce luncheon, urged the adoption of a city ordinance requiring the use of brass piping from main street water pipes to houses and buildings. Answering the objection of the greater cost of the brass piping, he declared that it would be cheaper in the long run. He declared $7,627 was unnecessarily spent in the last year in the city for permits, excavating and new pavements which the use of brass pipe would have obviated.

**Dr. W. Blum**, chemist of the Bureau of Standards, spoke, March 3rd, on "Researches in Nickel Deposition," in the Chase auditorium, to the local branch of the American Electro-Platers Society. Local manufacturers, superintendents, electro-platers and others connected with the industry attended. The research committee of the local branch has been co-operating with the Bureau of Standards and with the chemical departments of the leading universities for some time.

The American Brass Company refuses to accept the 170 foot layout of the Naugatuck river decided upon by the city engineer, insisting that the layout shall be but 150 feet. Practically all the other property owners with land adjoining the river have accepted the 170-foot layout. It is expected that a compromise will be effected between the city and the company.

**Frederick Mathan** has been elected president of the **Plume & Atwood Manufacturing Company** Foremen's Association; William Black, vice-president; Philip Chabot, treasurer; Clifford Fenn, secretary.

**Albert F. Rockwell**, president of the **Bristol Brass Company**, lost out in his fight to retain control, being defeated for president at the annual meeting, March 1, by the so-called Barnes' faction. Mr. Rockwell has been blamed by the Barnes' faction for the condition of the company since the war and has been the target of a lengthy campaign waged by the Barnes faction to oust him. The Barnes' faction, at the recent meeting, overthrew the past board of directors and elected an entirely new board, which selected Alexander Harper of Bristol as president in place of Mr. Rockwell. The vote was 32,000 shares to 23,000 shares.—W. R. B.

### BRIDGEPORT, CONN.

April 1, 1924.

The **Whiting Manufacturing Company**, silver manufacturers, with a plant on Bishop avenue, will be removed from this city to Providence, May 1, according to information from Rhode Island, following a meeting of the directors of the **Gorham Manufacturing Company**. **Edmund C. Mayo**, new head of the Gorham company and formerly president of the **American Tube and Stamping Company**, here, recommended that the change be made. Products of the local firm will continue to be made in Providence under the Whiting name. Surplus floor space of the Gorham company, of which Whiting is a subsidiary, will be utilized for the change.

Determined opposition to removing the plant, which came here 15 years ago through inducements offered by the old Board of Trade, is expected to develop in local circles. The firm employs about 160 workers. It is said to be the best lighted plant in the city with a total floor space of 60,000 square feet.

Reorganization involves merger not only with the Gorham company but with the **William B. Kerr Company, William B. Durgin Company** and the **Silversmiths Company** of New York. The latter is said to own 99 per cent of the stock of the Gorham company. This merger has been approved by a committee of stockholders. The name of the new company will be the Gorham Manufacturing Company.

A dividend of 8 per cent was declared at the first annual meeting, last month, of the **Dictaphone Corporation**, which last year, purchased the dictaphone business of the **Columbia Graphophone Company**. A surplus of $4,291 remains after dividends. The corporation manufactures its product completely in Bridgeport. It owns subsidiary companies in 25 states, exclusive of foreign agencies.

Thirty-five students of the **Massachusetts Institute of Technology**, in a special car, visited the **Bridgeport Brass Company** and the **Bullard Machine Company**, on a tour of inspection, last month. The students were under the supervision of the faculty, **Prof. Erwin H. Schell** and **H. L. Bond**, members of the Corporation Five. They made the trip to gather practical knowledge of methods in leading industrial plants. Two Connecticut men, **J. J. Kramer** and **W. L. Wye**, were in the party.

There are prospects that the **Bridgeport Safety Emery Wheel Company** of 82 Knowlton street will leave Bridgeport in the near future and build a new factory in Stratford at Linden avenue and West Broad street. It is learned that the company has submitted plans to the town manager for a new building to be erected on a site 250 by 90 feet adjoining the present branch factory of the concern near the railroad tracks at West Broad street.—W. R. B.

### TORRINGTON, CONN.

April 1, 1924.

The **Fitzgerald Manufacturing Company** held its annual meeting in March and elected officers as follows: President, P. F. Fitzgerald; vice-president, M. D. Fitzgerald; treasurer, M. F. Fitzgerald; and secretary, B. G. Peck. These four officers constitute the board of directors. An 8 per cent dividend on the preferred stock was voted, payable March 18.

A new booklet advertising Torrington has been issued by the Chamber of Commerce and will be distributed with the co-operation of Torrington manufacturers.

**Mrs. George H. Turner**, widow of a former vice-president of the American Brass Company, died March 24, in Clearwater, Fla. The body was brought to Torrington for burial. **Mr. Turner** died suddenly in February, 1912. He was for many years associated in an executive capacity with the **Coe Brass Company** and subsequently was elected a vice-president of the **American Brass Company.**

Industrial conditions in the Naugatuck valley now show a slight but sure improvement over the past two months and the end of March will see the great metal industries of the valley on full time with a full force at full wage, Deputy Commissioner of Labor John J. Burke said in Hartford recently. Indications of the same advance in all subsidiary industries throughout the district exist, Mr. Burke said, and the full time activity will continue for several months to come.—J. H. T.

### NEW BRITAIN, CONN.

The advent of Spring finds New Britain's metal manufacturing companies on practically the same manufacturing basis as has obtained all Winter—plenty of orders, business outlook good and no labor or labor disputes. This applies to practically every business in the city. Without going into an itemized list of the concerns, it can be stated generally that business is good and the outlook for the Summer equally so.

The **Bristol Brass Company**, which underwent a change of management last month, no longer is under the direction of **A. F. Rockwell.** At the stockholders' meeting he was defeated for reelection as president and in his place Alexander Harper was elected.

The **National Marine Lamp Company** also has been going through a period of strife. Former President **Rudolph Stern** had charged gross inefficiency in management, but at the stockholders' meeting President **William P. Calder** was reelected. Reports showed the concern to be making money.—H. R. J.

### PROVIDENCE, R. I.

The close of March brings the industries of this city and vicinity to the end of the first quarter of the year, with generally satisfactory results. Nearly every line of the metal trades has shown an improvement in activity over conditions of the corresponding period of the last few years and the present outlook is for a consistent and continual increase of business. In the building trades there has been a very material improvement over the past few years and there are indications of a possible building boom during the coming months that with the increasing demand for metallic work bespeaks a growing activity.

In the jewelry lines, while there is not so much promise as in some of the other metal lines, there is a healthy and encouraging tone that is especially satisfactory. Just at the present time novelties are in the most demand, while earrings of every description are in the ascendant. Bracelets are also commanding a good trade.

The electroplating business of the late **John F. Brady** of Providence has been incorporated with an authorized capital of 500 shares of common stock without par value. The incorporators are **Joseph C. Brady**, president; Mrs. Mary C. (John F.) Brady, treasurer, and James V. Egan, secretary. The business will be continued in the future at the same location under the firm style of John F. Brady Inc.

Pay Roll data as gathered by the state show that the average weekly earnings in thirty manufacturing jewelry establishments of North Attleboro during the month of January was $23.08 and in February $22.73. The number of employees in the firms reported was 2,918. Eighteen of the firms reporting stated that their plants were operating on normal full time capacity, four on less than part time capacity and eight on part time and part capacity.—W. H. M.

## MIDDLE ATLANTIC STATES

### ROCHESTER, N. Y.

April 1, 1924.

Reports from the several brass foundries about town indicate that during the past month much better business has been noticed. All the foundries have been working full time, and while all of the brass moulders in this city are not required in the foundries, they are working in other metal-using plants. Most of the business of the brass foundries consists of small job work and builders' materials. Demand for copper and brass is very good at this time.

Owing to the unusual building activity this spring, demand for tin, lead, aluminum and finished brass materials is very firm. Purchasing agents of the larger establishments declare stocks have been depleted faster during the past month than at any time in the past six months. Much buying to renew warehouse stocks has been necessary since March 15th, delivery being required in thirty days and in some instances in less time.

Without exception, manufacturers, who can be induced to talk along business lines, insist that prospects are much better this spring than a year ago and that coming summer and fall promises much.

At the annual election of the **Todd Protectograph Company**, held recently, Fred H. Bloom was elected to the board of directors. Mr. Bloom was a clerk in the company's purchasing department some ten years ago, and later became one of the company's best salesmen.—G. B. E.

### NEWARK, N. J.

April 1, 1924.

**Federal Judge Lynch** has signed an order directing officers and creditors of the **Newark Metal Bed Company**, with a factory at 31 Summer avenue, Newark, N. J., to show cause why the receivership of the company should not be extended to the Keystone Furniture Company. The Newark concern was organized in 1921 by Max Hollander, president, and Jacob Rabinowitz, treasurer. Gross sales of the bankrupt concern from the bed division amounted to $101,550.99, showing a loss of $11,093 in 1923.

**F. A. Clauberg** has filed a certificate of incorporation with $125,000 capital to manufacture all kinds of cutlery and edged tools. The company has an office at 410 Lewis street, Union Hill, with Theodore Gliedt as agent. The incorporators are

F. A. Clauberg and Walter Clauberg, of West Hoboken and Theodore Gliedt, Weehawken.

The **Bowen Hardware Corporation,** of New York, will open a manufacturing plant at Elizabeth in May. The concern will employ about fifty hands.—C. A. L.

### TRENTON, N. J.

April 1, 1924.

The **John A. Roebling's Sons Company** has purchased the foundry plant of the **Duncan Mackenzie's Sons Company** adjoining the factory of the former and will continue the same as a foundry. The price was approximately $100,000 and this will be approved by the Court of Chancery. The Roebling Company has no foundry among its plants and the new addition comprises modern machinery and equipment. Besides the plant the Roebling Company purchased considerable land.

**Fred Rost,** of Newark, N. J., has purchased the controlling interest of **Charles F. McCoy** in the **Trenton Electric Supply Company.** Mr. Rost is at the head of a chain of electrical supply stores in Newark and Jersey City.

The **E. J. Scudder Foundry & Machine Company,** with a plant and offices at Canal and Pearls streets, Trenton, has been incorporated with $50,000 capital. The incorporators are Edward J. Scudder, George W. Young, Harry Y. Lewis and Peter Oswald.

A meeting of the directors of the **Aluminum Wheel Company of America** was held recently when plans were made to reorganize the corporation and take over the plant at New Brunswick. The new corporation will be composed of many of the stockholders of the old concern. The stockholders will have the option of exchanging their wheel shares for shares in the new corporation. If the plant is sold the money will be returned to the stockholders. The company has patent rights.

The **Mu-Rad Laboratories, Inc.,** has purchased a three-story building at Asbury Park for $85,000 and will manufacture a radio transformer. The company was incorporated in 1922 to make receiving sets and broadcasting receivers.

The **New Jersey Lamp & Manufacturing Company,** 711 Hudson street, Trenton, N. J., has been incorporated with $25,000 capital by Joseph Sommers, Frank B. Clark and Peter K. Clark. The two Clarks were officials of the old **Trenton Lamp & Brass Company.**

The **Trenton Emblem Company** was the only Trenton metal concern to have a modern exhibit at the Own Your Home Exhibition at the Trenton armory.—C. A. L.

### PHILADELPHIA, PA.

April 1, 1924.

General satisfaction is expressed with conditions in the metal industry at this time. Buying is chiefly of a conservative nature, consumers covering only for immediate requirements. Business, however, is being received in sufficient volume to keep local dealers busy filling the demand.

Aluminum sales show a slight recession in volume, though business generally has been good. Orders placed in January and February are keeping producers fairly busy, with the outlook good for the resumption of brisk trading in the near future. Prices have been stable with little prospects of any immediate fluctuations. Secondary aluminum is in best demand. While supplies are normally heavy, dealers find little difficulty in moving stock at current quotations.

Copper buying has been quiet. Because of the influx of foreign copper in the local market prices have declined to some extent. This decline was expected regardless of the foreign situation because, as leading authorities say, the advance was so sharp that it would be possible to maintain them only under sustained buying. Manufacturers of copper wire cloth are now preparing for the usual heavy demand. Hardware dealers and jobbers are sending in their orders for summer screen cloth in anticipation of the spring demand. The bulk of the orders call for 16-mesh instead of 14-mesh. This is said to be the result of last summer's campaign for finer mesh screens. Inquiries on contract lots for suburban developments show signs of sustained demand for the coming three months. Prices continue firm.

It was learned from reliable sources recently that a large oil company operating a fleet of tankers had placed a contract with the **William Cramp & Sons Ship & Engine Building Company** for four bronze propeller blades, weighing approximately 4,700 pounds each. The blades will be for an 18-inch wheel and will be used on a 10,000-ton tanker.—A. F. C.

## MIDDLE WESTERN STATES

### PITTSBURGH, PA.

April 1, 1924.

Sub-Committees of the **American Society for Testing Materials,** in a three-day session at the William Penn Hotel, Pittsburgh, Pa., this month prepared an outline of research work in the metal industries to be carried on and presented at the annual meeting of the society in June in Philadelphia, Pa.

Members of the society had an enjoyable time on their inspection trip through the **Westinghouse Electric & Manufacturing Company's** plant in East Pittsburg.

In the filing of voluntary bankruptcy papers by **Meyer Shubow** and the **Liberty Bag & Metal Company** of Reading, Penna., of which Shubow was an officer, assets are given as $390,000 and liabilities $480,000.

Zinc plates are in light demand at present. Marine construction and repair have fallen to a minimum, with little expectancy of resumption of activity for some time. Zinc in sheets and strips are moderately active. Demand for strips from battery manufacturers is excellent, with radio demand deminishing as the season draws to a close. The open winter has made sales of sheets total a greater volume than last year. Inquiry and advance orders indicate that business from the building trade will be as big if not better than last year. The increase in demand is expected to have a firming influence on prices, which have been easy lately, though no general reductions were made.

Type founders find a good demand from job plants and periodicals for type and supplies. Job printers are inclining more and more to modern automatic machines which found their first favor in war times on account of the labor shortage.—H. W. R.

### DETROIT, MICH.

April 1, 1924.

President **Frank C. Root,** in a statement accompanying the annual report of the **General Aluminum & Brass Manufacturing Company** of Detroit, states that competition in 1923 was very keen. "But in spite of that," he says, "we have been able to retain all our customers, and in view of all conditions, show a satisfactory and substantial progress. We have on our books a very large volume of business, and the outlook for 1924 warrants the belief that we should do better than we did in 1923. Our net profits for 1923 before Federal taxes were paid were $225,616 as compared with $26,683 for 1922. This has enabled us to pay the preferred stock dividends, pay a dividend on the common stock and transfer to surplus $105,016."

**John K. Light,** at one time with the **Joseph N. Smith & Company,** Detroit, has been appointed manager of the Detroit office of the **Root Company,** Bristol, Conn., manufacturers of automatic brass hinges, metal stampings and automatic counters. A considerable amount of the firm's output is used in the automobile industry.

The **McCord Radiator & Manufacturing Company** shows a balance sheet as of December 31, 1923, with total assets of $4,829,036. During the ten months of the past year the net income is reported as $888,896, after deductions for all charges excepting federal taxes. Besides radiators, this company manufactures lubricators, copper gaskets and cork gaskets.

**H. M. Verplank,** proprietor of the **Central Welding Company** at Lansing, Mich., states that property has been purchased for a new building, 40 by 100 feet, one story and of brick construction.—F. J. H.

It is announced that the **Nagel-Wallace Brass Works** has opened the Superior Hardware Store at 3529 Michigan avenue for the purpose of bringing its products into the retail market. According to William C. Nagel, president, a new factory soon will replace the present one, and with increased capacity. "Our business has increased steadily," he says, "through the entire fifteen years our firm has existed. The Nagel-Wallace Company is the only concern in Detroit that manufactures brass and aluminum house numbers. Besides these many other products in daily demand are produced.

The **American Radiator Company,** of which the **Detroit Lubricator Company** is a unit, reports an unusually successful year. The net income aggregated $9,168,017, as compared with $5,759,669 the previous year. The aggregate sales, including foreign business, totaled $78,696,715.

The **Pemberthy Injector Company** has declared a quarterly dividend of 2 per cent on its preferred stock of record of March 25. The **Detroit Brass & Malleable Works** also has declared its regular monthly dividend of one-half of one per cent, to stock of record of March 26. The **Detroit Copper & Brass Company** announces a 2½ per cent dividend to stock of record of March 28. This is at the rate of 10 per cent a year as compared with previous returns of 6 per cent.—F. J. H.

## INDIANAPOLIS, IND.

April 1, 1924.

The **Indianapolis Plating Company,** Indianapolis, was ransacked recently and littered with papers and other materials, according to police reports. **Cecil Teelor,** part owner, was unable to say whether anything was taken.

The **Bronze Piston Ring Company,** Indianapolis, Ind., capitalized at $75,000, has filed articles of incorporation with the secretary of state. The company will manufacture piston rings. The incorporators are: Albert A. Bouvey, Walter J. Six and Austin J. Edwards, of Indianapolis.

The roof of the **Laporte Foundry & Furnace Company,** Laporte, Ind., was destroyed by fire recently. Officials of the company placed the damage at $10,000. The cause of the fire is not known. It was not discovered until flames were seen shooting from the roof of the plant.—E. B.

## CHICAGO, ILL.

April 1, 1924.

The metal industries in Chicago are experiencing some slackness, but the condition is believed to be seasonal and temporary. The seasonal decline has come somewhat earlier than usual, it is said, but the trade is taking the optimistic view that if it comes early it will be over early. Men in the business assert that general business conditions are sound and that for this reason the metal industry cannot lag but must go ahead steadily.

Demand of manufacturers of storage batteries for metals continues strong. Some report that demand for metals for printing plants, for white metal castings and for die castings had fallen off as much as 25 to 30 per cent.

"There is some seasonal quietness in the trade, but our sales are fair and we are optimistic over prospects for the future," said **George Birkenstein,** purchasing agent for the Globe Metal Company.

"Business has slowed down somewhat during the last few weeks," said **R. G. Raphael,** sales manager of the Great Western Smelting & Refining Company. The condition, however, is seasonal and temporary, he believes. The Great Western Smelting & Refining Company has completed and put into operation its new plant at St. Louis.

**W. Y. C. Hunt,** manager of the **Midland Metal** Company, is another who is optimistic over business prospects for the next few months. Curtailment of buying has caused some tendency to weakness in lead, and there was a slight break in the tin market. Demand for both of these metals has been consistently good, though, Mr. Hunt said, and should cause a quick recovery in the markets. Tinfoil constitutes most of the business of the Midland company.

The **Hoyt Metal Company** looks beyond a short seasonal slump to a period of good business. While the slack season has come earlier than usual, it is believed that sound general conditions insure an early recovery. Demand from manufacturers of storage batteries continues to be splendid, it is said at the Hoyt plant, although demand for printers' metals, and for white metal castings and die castings has declined noticeably.—L. B. G.

# Business Items—Verified

The **Aluminum Goods Manufacturing Company,** Manitowoc, Wis., is contemplating the erection of a new building. No decision has been reached as yet, and the work may not be undertaken for several months.

The **Celluloid Zapon Company,** the Zapon Leather Cloth Company and Richards & Company, subsidiaries of the Atlas Powder Company, will move their offices from 200 Fifth avenue to the Park-Lexington Building, Park avenue, New York City.

The **General Electric Company** has moved the headquarters of its East Central district from Cincinnati to Cleveland on March 1st. In the latter city, combined with the local Cleveland office of the company, it will be located in the new Union Trust Company building.

**Keystone Silver, Inc.,** 165 W. 18th street, New York City, recently damaged by fire, is now located at 410-16 East 32d street, with much larger quarters, and facilities to meet the demands of customers. This concern manufactures an extensive line of silver-plated hollow-ware.

Directors of the **American La France Fire Engine Company, Inc.,** Elmira, N. Y., have declared a dividend of $1.75 on the preferred stock, payable April 1 to stock of record on March 24; and of 2½ per cent on the common stock, payable May 15 to stock of record on May 1st.

The **Speakman Company,** 30th and Spruce streets, Wilmington, Del., manufacturer of plumbing fixtures and equipment, has filed plans for a 1-story addition to its foundry, estimated to cost $60,000 with equipment. This concern operates the following departments: brass foundry, brass machine shop, tool room, grinding room, plating, soldering, polishing.

**J. S. Cottrell,** U. S. Minister at La Paz, Bolivia, reports that export duties on tin from Bolivia have been increased by an executive decree, effective January 16, 1924. Rates are based on the current cash price quotation in the Bolivian market, or quotations in the London market. They can be obtained from the Department of Commerce, Washington, D. C.

Records of the tax data of the **Aluminum Company of America** and others have been sent to the Senate Sub-committee of the Finance Committee investigating the Internal Revenue Bureau in Washington, D. C., by Secretary Mellon. This was done to disprove the charge that the Treasury Department was favoring companies in which he was interested.

The **Pri-co Manufacturing & Sales Company,** Grove City, Pa., manufacturer of aluminum novelty wares, has acquired a new building at Tidioute, Pa., and will move its plant and office to that city about May 1st. This concern operates the following departments: aluminum foundry, brass machine shop, casting shop, brazing, plating, stamping, soldering, polishing.

**Florida Machine Works,** Jacksonville, Fla., has completed a new plant for manufacture of iron and brass castings and forgings. An electric furnace for steel castings production is being installed. Machinery from the old plant will be moved into the new. F. G. Russell is proprietor. This concern operates the following departments: brass and bronze foundry.

The **Maytag Company,** Newton, Iowa, manufacturer of agricultural equipment, washing machines, etc., is erecting an aluminum foundry, 200 ft. by 100 ft., to be completely equipped with conveying systems and sand handling equipment. This concern operates the following departments: aluminum

foundry, brass machine shop, tool room, grinding room, galvanizing, polishing.

**Wolff Manufacturing Corporation,** 225 N. Hoyne avenue, Chicago, Ill., has awarded contracts to the Austin Company, Cleveland, for constructing a $100,000, 125 x 156-foot enameling plant. Remodeling of the storage warehouse for use as a machine shop and brass foundry is contemplated. This concern operates the following departments: brass foundry, brass machine shop.

The **Yale & Towne Manufacturing Company,** Stamford, Conn., reports for 1923 net earnings of $3,341,303, after all deductions for operating expenses and reserves for depreciation charges. This compares with net earnings of $2,793,559 reported in 1922 after the same deductions. After reserves for Federal taxes there were net profits of $2,890,623 available for dividends against $2,406,664 reported in 1922.

The **Prime Manufacturing Company,** 653 Clinton street, Milwaukee, Wis., manufacturer of brass and bronze railroad and automotive castings and materials, is taking bids through Frank D. Chase, Inc., Chicago, Ill., for the construction of a brick and steel brass foundry, 80 x 160 ft., one to three stories. This concern operates the following departments: brass, bronze and aluminum foundry; brass machine shop, polishing.

The **Fulton Company,** Knoxville, Tenn., W. M. Fulton, president, plans the purchase of additional equipment for a $50,000, 2-story, 60 x 144-foot plant addition now under construction. The company manufactures temperature regulators and valves. This concern operates the following departments: brass, and bronze foundry; brass machine shop, tool room, grinding room, plating, japanning, stamping, soldering, polishing, lacquering.

The **Combustion Utilities Corporation,** New York, announces that, through Henry L. Doherty and Company, the parent organization, it has acquired the Surface Combustion Company. On January 1, 1923, the Combustion Utilities Corporation, absorbed the **Improved Appliance Company,** the aim of the consolidation being at that time to bring into a single organization the forces of two successful companies. At present, it is planned that the combustion Utilities Company and the Surface Combustion Company shall maintain their own identities.

**H. H. Ross,** attorney for the Fairmont Trust Company, trustees for the **West Virginia Metal Products Corporation,** sold at auction, the property of the company and the equipment, to C. F. Patterson, Pittsburgh attorney, representing the bondholders committee, for $500,000, early in March. The bondholders' committee is composed of J. H. Rickettson, Jr., A. L. Ashby and Osman Swartz, who is chief counsel for the Consolidation Coal Company, with offices in New York. The property is valued to-day at about $1,500,000, allowing for all depreciation since the plant was built several years ago. No statement has been made as to future plans of the purchasers.

Final arrangements for representation in the far west were recently announced by the **Zeller Lacquer Manufacturing Company** of New York City, in the establishment of two new branch offices with stock rooms, in California and a distributorship in Denver, Col. The branch offices are in Los Angeles and San Francisco, and the Denver distributorship has been arranged with the **Ormor Sales and Supply Company,** at 1428 Court place, where a stock room is maintained. The company's offices in Los Angeles are at 603 East Seventh street, and in San Francisco, 67 Steuart street. Each of the California offices is also connected with stock rooms. C. H. Gaylord has been appointed to take charge of the Los Angeles office, and W. W. Partridge will manage the San Francisco office. Both men are well known for their records of service in this field.

## INCORPORATIONS

The **Ram Metal Products Company,** 1848 Webster avenue, New York City, has been incorporated with $49,000 capital stock to manufacture metal specialties. Plans are not sufficiently developed to warrant any definite announcement. This concern will operate a stamping department.

## SILVER

Secretary Work of the Interior Department, on December 11, 1923, authorized the Bureau of Mines to initiate its proposed research into possible new uses for silver in commerce and industry and made temporary provision for the work through the release of a portion of the reserve funds within his charge. Secretary Work also directed that a supplementary estimate calling for $15,000 to support the research through the next fiscal year be prepared for consideration of the Bureau of the Budget. Dr. L. I. Shaw, assistant to the chief chemist, has been placed in charge of the investigation by the Bureau of Mines. The laboratory work will be done at the Rare and Precious Metals Experiment Station of the Bureau at Reno, Nevada.

## SCOVILL COMPANY COIN BLANKS

The Scovill Manufacturing Company of Waterbury, Conn., turned out 40,000,000 nickel blanks and 43,000,000 penny blanks last year for the United States Government. These coins are shipped to the Government Mints and there receive the impression of the United States Government, which makes them legal tender.

The blanks or planchets for the penny and nickel coins are stamped out from sheets of metal rolled down to the proper thickness. After inspection and either elimination or changing of the imperfect pieces, the blanks go to a milling machine where they receive the raised edge which protects the coin from abrasion.

Coining or making the impress is done at the Government Mint in a coining press between dies. The Scovill company has been making these coin blanks in one form or another for the Government since 1820.

## BRITISH COINAGE ALLOYS

The British Royal Mint is making efforts to revive in England the art of producing good medals, including portrait medals and is producing a series of medals and plaquettes for sale during the British Empire Exhibition at Wembley next year. The idea is a public demand for portrait medals for presentation purposes. A school of craftsmen would grow up and that incidentally this would prepare the way for a really good series of new British coins.

The criticism of the .500 fine silver alloy with which during the last two or three years the Mint, with a view to economy has been replacing the old .925 coinage has been considered. The new coins were of an unsatisfactory color and tarnished rapidly, but more recent issues present a better appearance. The authorities claim that they are now issuing coins of a color more nearly approaching that of the older coins. Experiments are still going on to find the best alloy for coins of .500 silver. So far the alloy giving the best results is one containing 50 per cent. copper. By an intensive process of pickling the blanks the pieces become thickly coated with fine silver. At present there is no data showing how long this surface will withstand hard wear, but the Mint claims to be issuing new coins of a color much more nearly approaching that of the old silver coinage.

A notable feature in the post-war history of the Mint is that since 1918 no gold coins have been struck. The number in 1912 was 36,542,237. The total number of silver coins struck at the British Mint last year was 92,340,203, representing £6,318,281 and of bronze 37,038,658 representing £100,848. Included in the silver coinage are 1,609 fourpenny, 2,074 twopenny and 1,758 penny pieces under the head of "Maundy money." These coins are presented with gifts of clothing to old people on Maundy Thursday (the day before Good Friday) at an annual ceremony which replaces the ancient custom of the washing of feet by the king. The smallness of the output of coinage in recent years is of course due to the extensive use of paper money which commenced during the war. At the end of 1920 the Treasury currency notes in circulation had reached a face value of £365,000,000. Resumption has since been proceeding slowly and the outstanding currency notes now have a value (much less below par) of about £281,000,000.—G.

## SECONDARY METALS RECOVERED

| | Short tons 1920 | Value | Short tons 1921 | Value | Short tons 1922 | Value |
|---|---|---|---|---|---|---|
| Copper, including that in alloys other than brass | 130,600 | $48,060,800 | 113,350 | $29,244,300 | 144,100 | $38,907,000 |
| Brass scrap remelted | 259,800 | 77,454,500 | 148,500 | 32,000,000 | 274,000 | 58,100,000 |
| Lead as metal | 56,350 | 19,944,000 | 46,370 | 9,340,200 | 75,480 | 17,551,600 |
| Lead in alloys | 68,300 | | 57,410 | | 84,080 | |
| Zinc as metal | 42,850 | 8,181,000 | 33,833 | 3,967,300 | 69,314 | 9,070,300 |
| Zinc in alloys other than brass and and in chemical compounds | 7,650 | | 5,840 | | 10,250 | |
| Tin as metal | 7,200 | 22,705,700 | 5,400 | 9,668,500 | 6,570 | 12,443,500 |
| Tin in alloys | 16,300 | | 11,500 | | 12,940 | |
| Antimony as metal | 200 | 938,560 | 29 | 464,400 | 182 | 765,700 |
| Antimony in alloys | 5,400 | | 4,691 | | 6,908 | |
| Aluminum as metal | 5,000 | 9,489,100 | 3,650 | 3,775,400 | 7,190 | 6,085,900 |
| Aluminum in alloys | 10,500 | | 5,250 | | 9,100 | |
| Nickel as metal | 270 | 1,733,600 | 86 | 680,400 | 104 | 967,700 |
| Nickel in nonferrous alloys | 1,930 | | 859 | | 1,408 | |
| ..... | | 188,507,260 | ..... | 89,140,500 | ..... | 143,891,700 |

These figures are from Secondary Metals in 1922 by J. P. Dunlop, U. S. Geological Survey, Washington, D. C.

## FOREIGN CONTROL OF RAW MATERIAL

Notice given by the American Government of its intention to investigate thoroughly the activities of foreign combinations controlling raw materials of vital need to American industry and for which our manufacturers are predominantly dependent on imports, has resulted in stemming the tide of advancing prices, according to the annual report of Secretary of Commerce Hoover for the past fiscal year, which will be made public shortly in accordance with the law.

In discussing the situation Secretary Hoover says: "There are a number of necessary raw materials for the supply of which we are predominantly dependent on imports from foreign countries. Possibly as a result of the war, but more particularly during the past 18 months, there has been a growing tendency for producers of these commodities to combine in control of prices as against the American market. This is particularly the case in **tin, mercury,** through our antitrust laws.

"The effect of these price combinations in the consequent higher cost to American consumers presents a most serious problem," Secretary Hoover declares, pointing out that while we are vigorous in control of price combinations in respect to our industries, we through our anti-trust laws.

## CHILE'S COPPER RESOURCES

A recent publication by a well-known mining engineer, Doctor Mauricio Hochschild, specializing in copper, contains some very interesting data on the present production and future development of copper in Chile.

If the estimates by this recognized copper expert are verified, Chile's copper wealth will very soon almost rival her vast nitrate resources. To quote from Doctor Hochschild's report:

"From the mines at present known, Chile can produce around 400,000 tons of fine copper per year, or say, at the present price of £73 per English ton of electrolytic copper, a total value of £29,200,000, which is more than the total value of the nitrate exported in a good year of this industry."

According to estimates made for 1918, the world's reserves of copper in sight at that period were computed at:

| | Tons |
|---|---|
| United States | 16,240,000 |
| Chile | 18,432,000 |
| Peru (Cerro de Pasco) | 1,500,000 |
| Mexico | 300,000 |
| Europe | 3,200,000 |
| Africa (Katanga) | 2,000,000 |
| Asia (Japan) | 700,000 |
| | 42,372,000 |

(The Grace Log)

## PLATINUM STOVE PIPES

It seems unbelievable that a metal of the value of platinum, of which the most expensive and choicest jewelry is made, and which at the present time is the most popular material for wedding and engagement rings, should a few years ago have been employed in the composition of the most ordinary household articles.

When a deposit of platinum was discovered in the Ural mountains in Russia about 50 years ago, the Russian government mined it and attempted the use of it in Russian coins. But it met with little enthusiasm and the coins at last were discarded. The deposits were so extensive that the material was very cheap. Manufacturers used it for purposes little better than those of tin. Cooking utensils of platinum, platinum umbrella handles, even platinum buttons on policemen's coat fronts were common in that country.

A few years later, when the supply of platinum was almost exhausted, its use as a material for jewelry-making was begun. The material was so hard to find that it was, of course, very expensive. A wholesale jeweler in this country decided to send buyers to Russia to purchase quantities of the articles for which platinum had been used. The men sent out were unsuccessful, for the Germans had been there first and bought up every available bit of platinum, and as one man wrote back, "There is not even a platinum stovepipe left."—Rochester Times-Union.

## METAL STOCK MARKET QUOTATIONS

| | Par | Bid | Asked |
|---|---|---|---|
| Aluminum Company of America | $100 | $510 | $540 |
| American Hardware Corporation | 100 | 69 | 72 |
| Anaconda Copper | 50 | 31¾ | 31⅞ |
| Bristol Brass | 25 | .. | 15 |
| International Nickel, com | 25 | 12½ | 13 |
| International Nickel, pfd | 100 | 78½ | 80 |
| International Silver, com | 100 | 80 | .. |
| International Silver, pfd | 100 | 105 | 108 |
| National Enameling & Stamping | 100 | 30 | 30½ |
| National Lead Company, com | 100 | 136 | 138 |
| National Lead Company, pfd | 100 | 112½ | 113 |
| New Jersey Zinc | 100 | 146 | 149 |
| Rome Brass & Copper | 100 | 120 | 135 |
| Scovill Manufacturing Company, new | .. | 225 | 240 |
| Yale & Towne Mfg. Company, new | .. | 69 | 70 |

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

## FEWER BRASS TRAPS

Manufacturers of tubular plumbing goods met Nov. 16, 1923, with the Division of Simplified Practices of the Department of Commerce and recommended that 1,114 varieties of combinations of brass traps now produced be reduced to 119 combinations. These 119 combinations represent 85 per cent. of the present production and will be submitted to the entire industry for approval, additions or eliminations. A general conference then will be called by the Division of representatives of manufacturers, distributors and users together with architects and engineers, to make the recommendation effective.

# Review of the Wrought Metal Business

Written for The Metal Industry By J. J. WHITEHEAD, President Whitehead Metal Products Company of New York, Inc.

Conditions in the brass and copper fabricated metal business during the month of February were unsatisfactory in some respects. The variations in the prices of ingot copper, with almost daily change from weakness to strength, and back again to weakness left consumers in a very unsettled mood and in doubt as to just what policy to pursue in buying.

As a result of this unsteady condition a great deal of buying was held up and various mills are now complaining that the volume of new business which has been placed within the last few weeks is so slight as to give them cause for alarm. As a matter of fact, while there are some signs of lessening activity in some lines, the consumption of brass and copper materials is still going forward at a rapid rate and many large consumers are again coming into the market for their immediate requirements.

As the month closed there was a further reduction in the price of rods, sheets, wire and tube in brass and copper with an extremely radical reduction in price of Admiralty mixture condenser tubes. Mills are running on full time however and most of them report production and shipments on a basis that compares well with the largest month in the history of the industry outside of the war years.

In nickel silver, Monel metal and pure nickel as well as other nickel alloys, business has been going forward at a rapid rate and the mills are all running on good substantial order books. An interesting development is the application of Monel metal to the ice-cream industry. Various companies have placed on the market iceless ice-cream cabinets to replace the old form of ice-packed cabinets. These new cabinets are electrically driven, self-contained refrigerators, and in their construction it is necessary that a non-ferrous metal be used having the proper resistance to corrosion. Monel Metal was chosen for this purpose for use in intake and exhaust valves, as well as for linings and covers.

The various wire manufacturers drawing nickel and Monel wire as well as nickel alloy wire, all report that business is very good and the industries consuming this wire seem to be running along in a satisfactory manner.

# Metal Market Review

Written for The Metal Industry by METAL MAN

### COPPER

Trade in copper was on a moderate scale in the month of March, although shipments on old contracts were large. Prices were irregular in both the domestic and foreign markets, but this feature was more noticeable when pressure to sell was resorted to.

Active speculative operations were carried on in the London market lately which had a decided influence on sentiment here. The foreign cables had much to do with the trend in local circles, but the speculative movements abroad failed to stabilize the market at the 14 cent level reached in the first half of March.

Early sales last month were on the electrolytic basis of 13⅞c to 14c, but closing prices for the month eased off to 13⅜c to 13½c. Recent business was done as low as 13⅜c delivered, but as this report is written there is a steady tone to the market at 13½c to 13⅝c.

Domestic production of refined copper is being curtailed somewhat at several properties, which is expected to remove some of the depression arising from over-production. Current consumption continues heavy, but not fully up to the best records. Deliveries into domestic consumption and for export in February were estimated at 234,000,000 pounds. The March figures were not available when this report was made out.

### ZINC

Market conditions for zinc are less satisfactory than they were. Recent foreign weakness was reflected in the lower domestic quotations. There has been less activity and the consequent dullness has forced concessions. Prime Western quotes 6¼c at E. St. Louis and 6.60c New York delivery. American stocks are large and output is likely to remain in excess of demand for some time longer. Europe has been turning out a larger tonnage lately and export demand is not so dependent on American supplies.

### TIN

The tin market was subjected to a number of wide and sudden breaks both here and abroad in March. Developments favored operations of the powerful bull groups for many months as they carried forward an aggressive campaign of price raising. A decided change has occurred in the situation recently, however, and the bull movement has suffered a severe setback owing to a less tense statistical position and to the cautious action of consumers. The market was consequently heavy and uncertain recently, with free offerings and a falling off in demand.

London advices on April 1 were firmer at £259 10s per ton for Straits, an advance of £3 10s over the previous quotation. New York market on same date was quoting 48¾c to 49¼c for future deliveries of Straits tin, with 49c bid for spot lots. American deliveries of foreign tin during March amounted to 4,560 tons, against deliveries of 8,845 tons in February. The March deliveries were the smallest in the last 11 months. Total American deliveries in first quarter of 1924 were 18,300 tons, as compared with 19,444 tons in first quarter of 1923, a decrease of 1,144 tons. Several steamers due in March failed to arrive in time for cargoes to figure in the March statistics.

### LEAD

New buying of lead lately is limited, but the official and outside prices are about the same on the basis of 9 cents a pound. There has been no advance by the American Smelting & Refining Co. since February 28, when the company advanced the base price to 9 cents. Consumption continues on a large scale, but seasonal requirements were contracted for earlier in the year and current needs are not specially urgent. Lead has had a phenomenal advance from 4.70c at the beginning of 1922, with demand exceeding all previous records. Output was taxed to keep up with consumption, but it is thought supplies will come in more freely and the market assume a more normal condition.

### ALUMINUM

Although consumption of aluminum by automobile manufacturers and for cooking utensils and electrical purposes is large, there appear to be ample supplies for the demand. Virgin ingot aluminum quotes 29c and 98-99% 28c. There were recent reports that general quotations were being shaded in certain quarters, but most dealers were holding prices steady. According to Government

statistics the value of aluminum produced in the United States in 1923 was $28,305,000, or more than double that produced in 1922 at domestic plants. It is estimated that 25% of the domestic product is consumed by makers of automobiles.

### ANTIMONY

The market for antimony weakened at the end of March owing to freer offerings for Chinese account. The tone of market as we make up our report is unsettled, and in this condition buyers are not disposed to purchase. China appears anxious to make sales at 11 cents duty paid, but consumers are cautious and have withdrawn active support by not placing important orders. Spot regulus quotes 10⅞c@11⅛c duty paid for carload lots.

### QUICKSILVER

The quicksilver market is strong and the advance in prices is the feature lately. Holders are now asking $70 per flask and higher levels are expected. Trading was not very brisk, but the strong position of the article was attracting attention. Recent London cables quoted £12 15s to £13.

### PLATINUM

From all indications sellers are firm at $122 per ounce for refined platinum. Present conditions enable holders to maintain steady prices.

### SILVER

Silver prices have held steady during recent weeks, the range having varied 66¾c and 64¼c. Transactions have been fairly large, with the chief support coming from India. The silver producers are working earnestly to compel the Government to buy through the Director of the Mint 14,589,730 ounces of fine silver at $1.00 per ounce in order to complete the purchases of silver authorized under the act of April 25, 1918, known as the Pittman Act. These purchases to be made to replace 29,000,000 standard silver dollars melted down when the Pittman Act was in force.

### OLD METALS

There has been a good movement in scrap metals, but a tendency to reaction in prices is seen since the lower prices developed for primary metals. Connecticut mills have been free buyers of new brass scrap and rod turnings. Dealers were inclined to accept business as it came along at best prices obtainable. Old yellow brass, aluminum scrap and clippings were in generous demand. Prices dealers were ready to buy at were 9¼c@9½c for light copper, 11¼@11½c for crucible copper, 6¼c@6½c for heavy brass, 5c@5¼c for light brass, 8c@8½c for new brass clippings, 7¼c @7½c for heavy lead, and 20½c@21½c for aluminum clippings.

## WATERBURY AVERAGE

Lake Copper—Average for 1923, 14.979—January, 1924, 13.00—February, 13.125—March, 13.875.

Brass Mill Zinc—Average for 1923, 7.479—January, 1924, 7.25—February, 7.50—March, 7.25.

# Daily Metal Prices for the Month of March, 1924

## Record of Daily, Highest, Lowest and Average

| | 3 | 4 | 5 | 6 | 7 | 10 | 11 | 12 | 13 | 14 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper** (f. o. b. Ref.) c/lb. Duty Free | | | | | | | | | | | | |
| Lake (Delivered) | 14.125 | 14.125 | 14.125 | 14.125 | 14.125 | 14.125 | 14.25 | 14.125 | 14.125 | 14.00 | 14.00 | 13.875 |
| Electrolytic | 14.00 | 14.00 | 13.75 | 13.75 | 14.00 | 14.00 | 13.95 | 13.95 | 13.95 | 13.85 | 13.70 | 13.65 |
| Casting | 13.625 | 13.625 | 13.625 | 13.50 | 13.625 | 13.75 | 13.75 | 13.75 | 13.75 | 13.625 | 13.50 | 13.375 |
| **Zinc** (f. o. b. St L.) c/lb. Duty 1¼c/lb. | | | | | | | | | | | | |
| Prime Western | 6.75 | 6.75 | 6.70 | 6.65 | 6.65 | 6.60 | 6.60 | 6.60 | 6.55 | 6.50 | 6.50 | 6.40 |
| Brass Special | 6.80 | 6.80 | 6.80 | 6.75 | 6.75 | 6.70 | 6.70 | 6.70 | 6.65 | 6.60 | 6.60 | 6.50 |
| **Tin** (f. o. b. N. Y.) c/lb. Duty Free | | | | | | | | | | | | |
| Straits | 56.50 | 55.75 | 56.625 | 57.00 | 56.75 | 57.50 | 58.50 | 58.75 | 56.50 | 56.875 | 56.25 | 53.50 |
| Pig 99% | 56.00 | 55.25 | 56.125 | 56.50 | 56.25 | 56.875 | 57.75 | 58.00 | 55.75 | 56.125 | 55.50 | 52.75 |
| **Lead** (f. o. b. St. L.) c/lb. Duty 2½c/lb. | 10.00 | 10.00 | 10.00 | 10.00 | 9.70 | 9.65 | 9.65 | 9.65 | 9.45 | 9.40 | 9.25 | 9.00 |
| **Aluminum** c/lb. Duty 5c/lb. | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 29.00 | 29.00 | 29.00 |
| **Nickel** c/lb. Duty 3c/lb | | | | | | | | | | | | |
| Ingot—Internat. Nick. Co. | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| Outside Spot | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| Electrolytic (Internat. Nick. Co.) | | | | | | | | | | | | |
| Ni.—99.80 contam. impur.—.14 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Brit.-Amer. Nick. Corp. | | | | | | | | | | | | |
| Ni.—98.50 contam. impur.—.80 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| **Antimony** (J. & Ch.) c/lb. Duty 2c/lb. | 11.50 | 11.50 | 11.50 | 11.50 | 11.50 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 | 11.25 |
| **Silver** (foreign) c/oz. Troy Duty Free | 64.00 | 63.875 | 64.00 | 64.125 | 64.00 | 64.25 | 64.00 | 64.25 | 63.875 | 63.75 | 63.75 | 63.875 |
| **Platinum** $/oz. Troy Duty Free | 125 | 125 | 125 | 125 | 125 | 123 | 123 | 123 | 123 | 123 | 123 | 123 |

| | 19 | 20 | 21 | 24 | 25 | 26 | 27 | 28 | 31 | High | Low | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper** (f. o. b. Ref.) c/lb. Duty Free | | | | | | | | | | | | |
| Lake (Delivered) | 13.75 | 14.00 | 14.00 | 14.00 | 14.00 | 13.75 | 13.625 | 13.625 | 13.625 | 14.25 | 13.625 | 13.988 |
| Electrolytic | 13.55 | 13.625 | 13.75 | 13.625 | 13.55 | 13.375 | 13.25 | 13.30 | 13.45 | 14.00 | 13.25 | 13.715 |
| Casting | 13.25 | 13.375 | 13.50 | 13.375 | 13.375 | 13.25 | 13.125 | 13.125 | 13.125 | 13.75 | 13.125 | 13.476 |
| **Zinc** (f. o. b. St. L.) c/lb. Duty 1¼c/lb. | | | | | | | | | | | | |
| Prime Western | 6.40 | 6.45 | 6.50 | 6.40 | 6.35 | 6.35 | 6.35 | 6.30 | 6.25 | 6.75 | 6.25 | 6.505 |
| Brass Special | 6.50 | 6.55 | 6.60 | 6.50 | 6.45 | 6.45 | 6.45 | 6.45 | 6.40 | 6.80 | 6.40 | 6.605 |
| **Tin** (f. o. b. N. Y.) c/lb. Duty Free | | | | | | | | | | | | |
| Straits | 54.25 | 56.50 | 55.50 | 53.50 | 52.00 | 51.00 | 52.00 | 51.00 | 49.00 | 58.75 | 49.00 | 55.012 |
| Pig 99% | 53.50 | 55.125 | 54.50 | 52.00 | 51.00 | 49.50 | 50.50 | 50.25 | 48.375 | 58.00 | 48.375 | 54.173 |
| **Lead** (f. o. b. St. L.) c/lb. Duty 2½c/lb. | 9.00 | 8.85 | 8.90 | 8.90 | 8.90 | 8.85 | 8.80 | 8.80 | 8.75 | 10.00 | 8.75 | 9.310 |
| **Aluminum** c/lb. Duty 5c/lb. | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 28.00 | 28.571 |
| **Nickel** c/lb. Duty 3c/lb | | | | | | | | | | | | |
| Ingot—Internat. Nick. Co. | 29 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 29 | 28 | 28.619 |
| Outside Spot | 28 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 28 | 27 | 27.619 |
| Electrolytic (Internat. Nick. Co.) | | | | | | | | | | | | |
| Ni.—99.80 contam. impur.—.14 | 32 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 32 | 31 | 31.619 |
| Brit.-Amer. Nick. Corp. | | | | | | | | | | | | |
| Ni.—98.50 contam. impur.—.80 | 28 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 28 | 27 | 27.619 |
| **Antimony** (J. & Ch.) c/lb. Duty 2c/lb. | 11.25 | 11.25 | 11.50 | 12.00 | 12.00 | 12.00 | 11.85 | 11.50 | 11.125 | 12.00 | 11.125 | 11.463 |
| **Silver** c/oz. Troy Duty Free | 63.875 | 64.00 | 64.25 | 63.75 | 63.75 | 64.00 | 64.125 | 63.875 | 63.75 | 64.25 | 63.75 | 63.958 |
| **Platinum** $/oz. Troy Duty Free | 123 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 122 | 125 | 122 | 123.095 |

## Metal Prices for April 7, 1924

**Copper:** Lake, 13.75. Electrolytic, 13.50. Casting, 13.25.
**Zinc:** Prime Western, 6.35. Brass Special, 6.45.
**Tin:** Straits, 52.50. Pig, 99%, 51.75.
**Lead:** 8.25. **Aluminum,** 29.00. **Antimony,** 10.25.
**Nickel:** Ingot, Internat. Nickel Co., 28. Outside spot, 27. Electrolytic, Internat. Nick. Co., 31. Brit. Am. Nick. Corp., 27.
**Quicksilver,** flask, 75 lbs., $72. **Silver,** oz. Troy, 63.625.
**Platinum,** oz. Troy, $118. **Gold,** oz. Troy, $20.67.

# Metal Prices, April 7, 1924

## INGOT METALS AND ALLOYS

| | |
|---|---|
| Brass Ingots, Yellow | 10 to11 |
| Brass Ingots, Red | 12 to14 |
| Bronze Ingot | 13 to14 |
| Bismuth | $2.40 |
| Cadmium | 75 |
| Casting Aluminum Alloys | 21 to24 |
| Cobalt—97% pure | $2.75 |
| Manganese Bronze Castings | 22 to35 |
| Manganese Bronze Ingots | 13 to16 |
| Manganese Bronze Forging | 33 to42 |
| Manganese Copper, 30% | 28 to45 |
| Parsons Manganese Bronze Ingots | 18¾to19¾ |
| Phosphor Bronze | 24 to30 |
| Phosphor Copper, guaranteed 15% | 18 to21 |
| Phosphor Copper, guaranteed 10% | 17½to21 |
| Phosphor Tin, guaranteed 5% | 58 to68 |
| Phosphor Tin, no guarantee | 56 to65 |
| Silicon Copper, 10%.....according to quantity | 28 to35 |

## OLD METALS

| Buying Prices | | Selling Prices |
|---|---|---|
| 11¼to11½ | Heavy Cut Copper | 12¾to13¼ |
| 10¾to11 | Copper Wire | 12¼to12½ |
| 9¼to 9½ | Light Copper | 10½to11 |
| 9¼to 9½ | Heavy Machine Comp | 10¾to11¼ |
| 6½to 6¾ | Heavy Brass | 8¾to 9¼ |
| 5¼to 5¾ | Light Brass | 6½to 7 |
| 6¾to 7 | No. 1 Yellow Brass Turnings | 7½to 8½ |
| 8½to 8¾ | No. 1 Comp Turnings | 9¼to10 |
| 5¼to 5¾ | Heavy Lead | 5¾to 6 |
| 2¼to 3 | Zinc Scrap | 3¼to 3¾ |
| 7¾to 8¼ | Scrap Aluminum Turnings | 10¼to10¾ |
| 13¾to14¼ | Scrap Aluminum, cast alloyed | 15¾to16¼ |
| 14¾to15¾ | Scrap Aluminum, sheet (new) | 15¾to17¾ |
| 21¼ | No. 1 Pewter | 25¾ |
| 12¾ | Old Nickel anodes | 14¾ |
| 20¾to22¾ | Old Nickel | 24¾to27¼ |

## BRASS MATERIAL—MILL SHIPMENTS

In effect March 31, 1924

To customers who buy 5,000 lbs. or more in one order.

| | Net base per lb. | | |
|---|---|---|---|
| | High Brass | Low Brass | Bronze |
| Sheet | $0.17¾ | $0.19½ | $0.21½ |
| Wire | .18¼ | .20 | .22 |
| Rod | .15½ | .20¼ | .22¼ |
| Brazed tubing | .25¾ | ..... | .31¼ |
| Open seam tubing | .25¾ | ..... | .31¼ |
| Angles and channels | .28¾ | ..... | .34¼ |

To customers who buy less than 5,000 lbs. in one order.

| | Net base per lb. | | |
|---|---|---|---|
| | High Brass | Low Brass | Bronze |
| Sheet | $0.18¾ | $0.20½ | $0.22½ |
| Wire | .19¼ | .21 | .23 |
| Rod | .16½ | .21¼ | .23¼ |
| Brazed tubing | .26¾ | ..... | .32¼ |
| Open seam tubing | .26¾ | ..... | .32¼ |
| Angles and channels | .29¾ | ..... | .35¼ |

## SEAMLESS TUBING

Brass, 21½c to 22½c net base.
Copper, 22¾c to 23¾c net base.

## TOBIN BRONZE AND MUNTZ METAL

| | |
|---|---|
| Tobin Bronze Rod | 19¾c net base |
| Muntz or Yellow Metal Sheathing (14"x 48"). | 17¾c net base |
| Muntz or Yellow Rectangular Sheets other Sheathing | 18¾c net base |
| Muntz or Yellow Metal Rod | 15¾c net base |

Above are for 100 lbs. or more in one order.

## COPPER SHEET

| | |
|---|---|
| Mill shipments (hot rolled) | 20¾c. to 22¾c. net base |
| From stock | 21¼c. to 23¼c. net base |

## BARE COPPER WIRE—CARLOAD LOTS

16c to 16⅛c net base.

## SOLDERING COPPERS

| | |
|---|---|
| 300 lbs. and over in one order | 20c net base |
| 100 lbs. to 200 lbs. in one order | 20½c net base |

## ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9¾c. basis less 8 per cent discount.

| | |
|---|---|
| Casks, jobbers' prices | 11c net base |
| Open casks, jobbers' prices | 11¼c to 11¾c net base |

## ALUMINUM SHEET AND COIL

| | |
|---|---|
| Aluminum sheet, 18 ga. and heavier, base price | 37c. |
| Aluminum coils, 24 ga. and heavier, base price | 35c. |
| Foreign | 38-40c. |

## NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

| | | |
|---|---|---|
| 10% | Quality | 25c. |
| 15% | " | 26¼c. |
| 18% | " | 27¼c. |

Nickel Silver Wire and Rod

| | | |
|---|---|---|
| 10% | " | 28¼c. |
| 15% | " | 31½c. |
| 18% | " | 34½c. |

## MONEL METAL

| | |
|---|---|
| Shot | 32 |
| Blocks | 32 |
| Hot Rolled Rods (base) | 40 |
| Cold Drawn Rods (base) | 48 |
| Hot Rolled Sheets (base) | 42 |

## BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

## SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 66¼c. to 68¾c. per Troy ounce, depending upon quantity.

Rolled sterling silver 64¼c. to 66¼c.

## NICKEL ANODES

| | | |
|---|---|---|
| 85 to 87% purity | 37½c.–39½c. | per lb. |
| 90 to 92% purity | 40c.–42c. | per lb. |
| 95 to 97% purity | 42c.–44c. | per lb. |

# Supply Prices, April 7, 1924

## CHEMICALS

In Commercial Quantities—New York Prices

| | | |
|---|---|---|
| Acetone | lb. | .15½–.16½ |
| **Acid—** | | |
| Boric (Boracic) Crystals | lb. | .12 |
| Hydrochloric (Muriatic) Tech., 20 deg., Carboys | lb. | .02 |
| Hydrochloric, C. P., 20 deg., Carboys | lb. | .08 |
| Hydrofluoric, 30%, bbls | lb. | .08 |
| Nitric, 36 deg. Carboys | lb. | .06 |
| Nitric, 42 deg. Carboys | lb. | .07 |
| Sulphuric, 66 deg. Carboys | lb. | .02 |
| **Alcohol—** | | |
| Butyl | lb. | .30–.35 |
| Denatured in bbls | gal. | .50–.55 |
| **Alum—** | | |
| Lump, Barrels | lb. | .04 |
| Powdered, Barrels | lb. | .04½ |
| Aluminum sulphate, commercial tech | lb. | .02½–.03 |
| Aluminum chloride solution in carboys | lb. | .06½ |
| **Ammonium—** | | |
| Sulphate, tech, Barrels | lb. | .03¾ |
| Sulphocyanide | lb. | .65 |
| Argols, white, see Cream of Tartar | lb. | .27 |
| Arsenic, white, Kegs | lb. | .16 |
| Asphaltum | lb. | .35 |
| Benzol, pure | gal. | .60 |
| Blue Vitriol, see Copper Sulphate. | | |
| Borax Crystals (Sodium Biborate), Barrels | lb. | .06 |
| Calcium Carbonate (Precipitated Chalk) | lb. | .04 |
| Carbon Bisulphide, Drums | lb. | .07 |
| Chrome Green, bbls. | lb. | .36 |
| Cobalt Chloride | lb. | — |
| **Copper—** | | |
| Acetate | lb. | .37 |
| Carbonate, Barrels | lb. | .18 |
| Cyanide | lb. | .46 |
| Sulphate, Barrels | lb. | .05½ |
| Copperas (Iron Sulphate, bbl.) | lb. | .02 |
| Corrosive Sublimate, see Mercury Bichloride. | | |
| Cream of Tartar, Crystals (Potassium bitartrate) | lb. | .27 |
| Crocus | lb. | .15 |
| Dextrin | lb. | .05–.08 |
| Emery Flour | lb. | .06 |
| Flint, powdered | ton | $30.00 |
| Fluor-spar (Calcic fluoride) | ton | $75.00 |
| Fusel Oil | gal. | $5.50 |
| Gold Chloride | oz. | 14.00 |
| **Gum—** | | |
| Sandarac | lb. | .26 |
| Shellac | lb. | .59–.61 |
| Iron, Sulphate, see Copperas, bbl | lb. | .02 |
| Lead Acetate (Sugar of Lead) | lb. | .13 |
| Yellow Oxide (Litharge) | lb. | .12½ |
| Mercury Bichloride (Corrosive Sublimate) | lb. | 1.15 |
| **Nickel—** | | |
| Carbonate Dry | lb. | .40 |
| Chloride, 100 lb. lots | lb. | .22¼ |
| Salts, single bbls | lb. | .10½ |
| Salts, double, bbl | lb. | .10 |
| Paraffin | lb. | .05–.06 |
| Phosphorus—Duty free, according to quantity | | .35–.40 |
| Potash, Caustic Electrolytic 88-92% fused, drums | lb. | .09 |
| Potassium Bichromate, casks | lb. | .09¾ |
| Carbonate,80-85%, casks | lb. | .06 |
| Cyanide, 165 lb. cases, 94-96% | lb. | .65 |
| Pumice, ground, bbls | lb. | .02½ |
| Quartz, powdered | ton | $30.00 |
| Rosin, bbls | lb. | .03 |
| Rouge, nickel, 100 lb. lots | lb. | .25 |
| Silver and Gold | lb. | .65 |
| Sal Ammoniac (Ammonium Chloride) in casks | lb. | .08 |
| Silver Chloride, dry | oz. | .86 |
| Cyanide | oz. | — |
| Nitrate, 100 ounce lots | oz. | .44¼ |
| Soda Ash, 58%, bbls | lb. | .02½ |
| **Sodium—** | | |
| Biborate, see Borax (Powdered), bbls | lb. | .06 |
| Cyanide, 96 to 98%, 100 lbs | lb. | .22 |
| Hyposulphite, kegs | lb. | .04 |
| Nitrate, tech. bbls | lb. | .03 |
| Phosphate, tech., bbls | lb. | .03¾ |
| Silicate (Water Glass) bbls | lb | .02 |
| Sulpho Cyanide | lb. | .45 |
| Soot, Calcined | lb. | — |
| Sugar of Lead, see Lead Acetate | lb. | .13 |
| Sulphur (Brimstone) bbls | lb. | .02 |
| Tin Chloride, 100 lb. kegs | lb. | .39 |
| Tripoli, Powdered | lb. | .03 |
| Verdigris, see Copper Acetate | lb. | .37 |
| Water Glass, see Sodium Silicate, bbls | lb. | .02½ |
| **Wax—** | | |
| Bees, white ref. bleached | lb. | .55 |
| Yellow, No. 1 | lb. | .35 |
| Whiting, Bolted | lb. | .02½–.06 |
| Zinc, Carbonate, bbls | lb. | .13–.17 |
| Chloride, 600 lb. lots | lb. | .07 |
| Cyanide | lb | .37 |
| Sulphate, bbls. | lb. | .03¼ |

## COTTON BUFFS

Open buffs, per 100 sections (nominal).

| | |
|---|---|
| 12 inch, 20 ply, 64/68, cloth | base, 40.85 |
| 14 inch, 20 ply, 64/68, cloth | base, 50.80 |
| 12 inch, 20 ply, 84/92, cloth | base, 46.20 |
| 14 inch, 20 ply, 84/92, cloth | base, 62.25 |
| 12 inch, 20 ply, 88/96, cloth | base, 63.25 |
| 14 inch, 20 ply, 88/96, cloth | base, 85.15 |
| Sewed Buffs, per lb., bleached and unbleached | base, .65 to .75 |

## FELT WHEELS

| | | Price Per Lb. Less Than 100 Lbs. | 300 Lbs. and Over |
|---|---|---|---|
| Diameter—10" to 16" | 1" to 3" | 2.75 | 2.50 |
| " 6" 8" and over 16" | 1" to 3" | 2.85 | 2.60 |
| " 6" to 24" | Over 3" | 3.15 | 2.80 |
| " 6" to 24" | ⅛" to 1" | 3.75 | 3.50 |
| " 4" to 6" | ¼" to 3" | 4.75 } | Any quantity |
| " Under 4" | ¼" to 3" | 5.35 } | |

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.